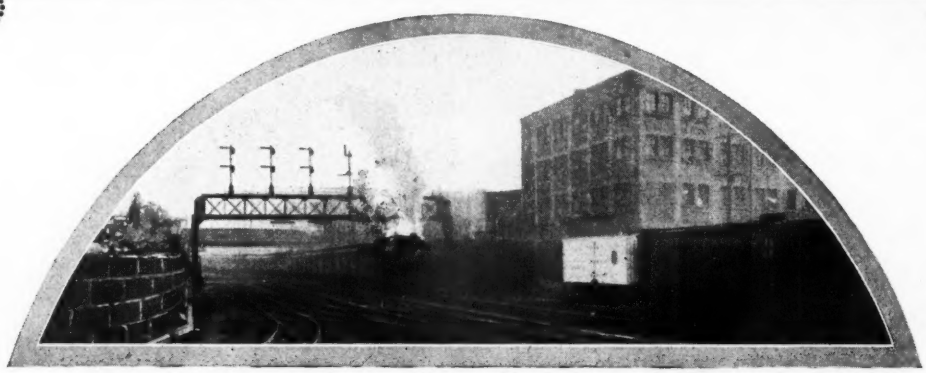
AUGUST, 1923

Railway Engineering and Maintenance

HIPOWER

HIPOWERS adequately, economically and permanently maintain the bolted security of Railway Track Joints. That's why they are universally used.



WHEN you think of the fast trains roaring over your road and the ponderous freights pounding along, the rolling loads transmitting enormous impacts, like giant sledgehammer blows, to the rails, you will appreciate the additional safety insurance which Reliance Hy-Crome Nut Locks give to the most vulnerable part of your trackage—the rail joints. ¶There are other good nut locks available, but in a close analysis of their relative merits, that *extra margin* of staying power in Hy-Cromes implies a measure of Safety and Saving which you cannot afford to ignore.

THE
RELIANCE MANUFACTURING COMPANY
MASSILLON, OHIO

BRANCH OFFICES: New York Cleveland Detroit Chicago St. Louis San Francisco
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RAILWAY ENGINEERING AND MAINTENANCE
Entered as second-class matter June 23, 1916, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published Monthly by Simmons-Boardman Publishing Company at 608 S. Dearborn St., Chicago. Subscription price, United States, Canada and Mexico, $2.00 a year; foreign countries, $3.00 a year.

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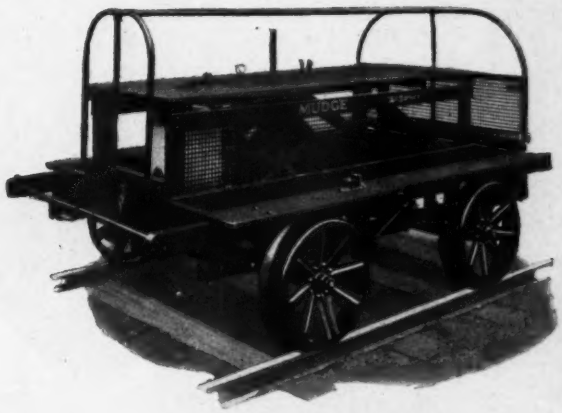
The "All-Service" for All Jobs

The Mudge "ALL-SERVICE" Motor Car "WS-1"



ADEQUATE POWER

Rated 8 H. P. Develops 12. Adapted to section or extra gang duty.

EASY ACCESSIBILITY

The tilting top facilitates inspection.

PERFECT BALANCE

One man can lift it on or off the track.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

50,000-Gallon Horton Conical-Bottom Tank, Louisville, Henderson & St. Louis Ry., Doyle, Ky.

"The type of steel tank which seems to meet the requirements of a railway more fully than any other is the conical-bottom tank."—Report of American Railway Bridge & Building Association Committee on Water Tanks

WHY?

The Horton conical bottom and large riser keep the water clean. Clean water means cheaper locomotive mileage. "Assuming that the water carries 50 grains per gallon of solids in suspension and that 40 per cent is removed by precipitation, it means that 7,000 lbs. of matter per million gallons of water is taken out of the water in the tank that would otherwise have to be washed from the boilers in the roundhouse as mud, or removed from the flues and sheets as scale."—Report of Committee.

Horton steel tanks may be cleaned of accumulated sediment any time without emptying. The labor cost is negligible. It is not necessary to put a gang of men at the job. The pumper or trackwalker can clean the tank by opening the Horton Washout Valve. "The chief advantage of this type of tank is in the precipitation of mud and sediment, for much of the matter carried in suspension is precipitated and collected in the bottom of the riser pipe where it may be washed out of the tank without interruption to service.—Report of Committee.

Steel tanks cost less in the end—considering long life, no repairs, no replacements, no maintenance except painting. **"The steel tank is more economical than the wood tank."**—Report of Committee.

Steel tanks are fireproof. There is no frost casing to burn and there are no parts to rot.

Steel affords the best in practical permanency. It will last as long as man can plan for in advance.

A steel tank has a clean-cut appearance. This is a real asset for a railroad whose properties are well kept.

Steel tanks are made water-tight when built, and remain so.

Steel tanks provide uninterrupted water supply. Continuous water service provides one more safeguard against delayed trains.

Engine tenders are getting larger, necessitating larger tanks. Steel tanks can be built in any reasonable capacity. Build larger water stations and reduce their number.

Chicago Bridge & Iron Works

New York, Chicago, Dallas, Atlanta, San Francisco, Montreal

218

HORTON TANKS

On the New Castle Division of the Baltimore & Ohio.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19 August, 1923 Number 8

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F. C. KOCH, *Business Manager*

WOULD YOU LIKE TO KNOW

How better climate was obtained by moving a treating plant 30 miles?

How to benefit from membership in associations?

How to secure greater service from cross ties?

How to solve a variable flow water supply problem?

How to increase the life of timber trusses?

Answers to these and other practical questions will be found elsewhere in this issue.

ELMER T. HOWSON, *Editor*

WALTER S. LACHER, *Managing Editor*

MILBURN MOORE, *Associate Editor*

DAVID A. STEEL, *Associate Editor*

H. F. LANE *Associate Editor (Washington, D. C.)*

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NEW ORLEANS: 927 Canal Street

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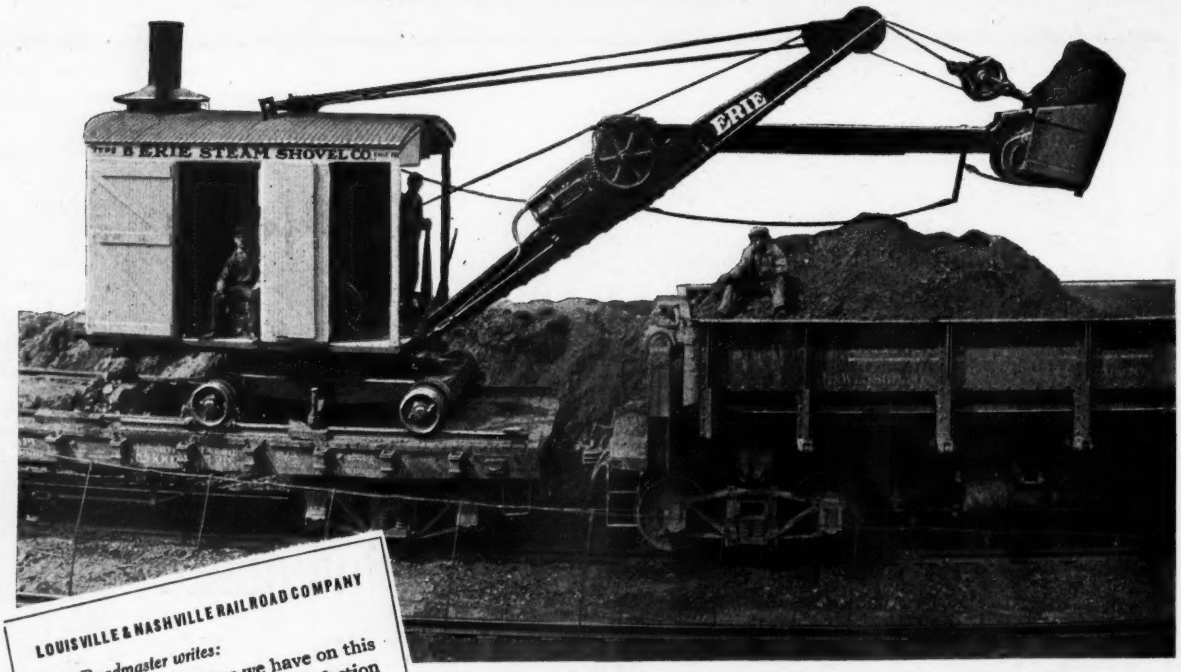


LOUISVILLE & NASHVILLE RAILROAD COMPANY

The Roadmaster writes:
"The ERIE Ditcher we have on this division is giving perfect satisfaction and we are very well pleased with it."
—J. O. Ely, Roadmaster.

The Assistant Superintendent writes:
"ERIE Ditcher No. 550 has proven itself to be first-class in every respect. It has met our expectations fully."—A. J. Lamb, Ass't Superintendent.

The Operator writes:
"The ERIE Ditcher is giving better results than any other machine ever used in this district. Last week, I loaded 136 cars of 20 cu. yds. each, averaging 453 cu. yds. per day, and had to keep clear of regular trains besides."—R. B. Rushton, Ditcher Engineer.

ERIE Ditcher has made good for the L. & N.

When the Louisville & Nashville bought their first ERIE Ditcher, they put it to work on the Birmingham Division. Here the ERIE was given test after test. The way that it proved up is shown by the three letters at the left, letters written by the men in direct charge of its operation.

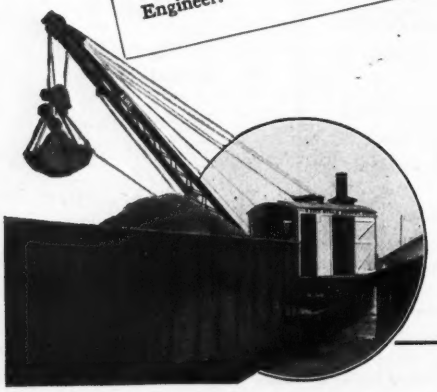
Since buying that first ERIE Ditcher, the L. & N. has bought four more.

Other progressive roads buy one ERIE Ditcher—and then come back for more.

The Pennsylvania owns 11 ERIE Ditchers; the Canadian National owns 6; the C. B. & Q. owns 4; Northern Pacific owns 4 and many other roads are using ERIE Ditchers with excellent results.

Progressive roads like these know that the ditcher which keeps on working steadily day after day, without frequent trips to the repair shops, is the right machine to use. They know the value of using the ditcher that is ***reliable***—and that's why they keep on buying ERIES.

If you are going to need additional ditching machinery, get full information on the ERIE. We will be glad to send you complete details, and interesting photos of the work the ERIE is doing for other roads—showing what it can do for your road. Write us.



The same ERIE that does your ditching handles your locomotive crane work, too.

Every ERIE Ditcher can be easily changed over to a locomotive crane in a few hours, to handle a clamshell or orange peel bucket; also works with a crane hook to handle ties, rails, bridge members, etc.

You don't have to lose any time sending an ERIE Shovel to the shops to change over to a crane. The job is done by any ordinary mechanic in a few hours, right on the job where it is to be used.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Incorporated 1883; formerly Ball Engine Co.
Builders of ERIE Steam Shovels and Locomotive Cranes.

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Chicago
Representatives throughout the U. S. A.
Export Representatives: Gaston & Co., Inc., 165 Broadway, New York

ERIE Railway Ditchers

"on New York's biggest rock job"

POWERS-KENNEDY CONTRACTING CORPORATION
149 BROADWAY, NEW YORK
PHONE: CORTLANDT 111

QUEENSBORO SUBWAY EXTENSION
FIELD OFFICE: BRYANT PARK, FIFTH AVENUE AND 42nd STREET
PHONE: LONGACRE 2203-4

May 1st, 1923

Wood Shovel & Tool Co.,
Piqua, Ohio.

Gentlemen:-

It may be of interest to you to know our experience with your MO-LYB-DEN-UM steel shovels on our job, the Queensboro Subway Extension, Routes 35 & 67.

This job consists of driving twin tunnels thru solid rock that is as hard as Pharaoh's heart. Due to clearance limitations it is necessary to muck by hand.

This is very severe service for shovels, since all of the rock is very sharp. Previous to using your Molybdenum steel shovels, we had used several other brands, and our shovel consumption was quite high. Handles and straps were broken, some blades bent out of shape and others curled up.

We have found it very profitable to maintain a careful check on all tools issued and since we have been equipped with your Molybdenum steel shovels, we estimate that our shovel bill has been cut in half, although the price per dozen is higher. Practically no handle breakage has occurred, and no breaking or buckling of the straps. The blades have simply worn out uniformly.

Since this Company is always glad to have others profit by its experience, you are at liberty to use this letter in any way you see fit.

Yours very truly,

POWERS-KENNEDY CONTRACTING CORP.
By George C. Bingham
Purchasing Agent

GCB/MM

—they cut their shovel bills in half

Nothing need be added to the above letter. It tells of another triumph for Wood's Mo-*lyb*-den-um Steel Shovels. It is the latest of thousands of tests which have proved that these shovels wear two to six times longer than any other shovels made.

This unusual wear has made Wood's Mo-*lyb*-den-um Shovels the favorites with purchasing agents in all parts of the world. They are favorites with the men, too, for the Mo-*lyb*-den-um steel blades are far lighter for a given strength. Write for complete information about the application of these super-shovels to all your needs.

THE WOOD SHOVEL & TOOL COMPANY

Piqua, Ohio U. S. A.

Wood's Mo-lyb-den-um Shovels

The American Super Steel

AIRCO
DAVIS APPARATUS
DAVIS-BOURNONVILLE CO.

ANYTHING AND EVERYTHING
FOR OXYACETYLENE WELDING AND CUTTING

SERVICE

ECONOMY

Public faith in a product is a reflection of faithful performance. Thus, consistently, have Airco Oxygen and Airco Acetylene built up good-will.

Write for Airco booklet:
"Anything and Everything for Oxyacetylene Welding and Cutting"

AIR REDUCTION SALES COMPANY

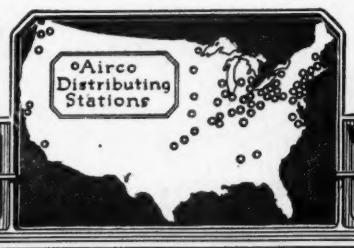
Manufacturer of Airco Oxygen — Airco Acetylene — Airco-Davis-Bournonville Welding and Cutting Apparatus and Supplies, Acetylene Generators, and Specially Designed Machines for Automatic Welding and Cutting— Nitrogen, Argon and other Airco Atmospheric Gas Products

Controls the manufacture and sale of National Carbide

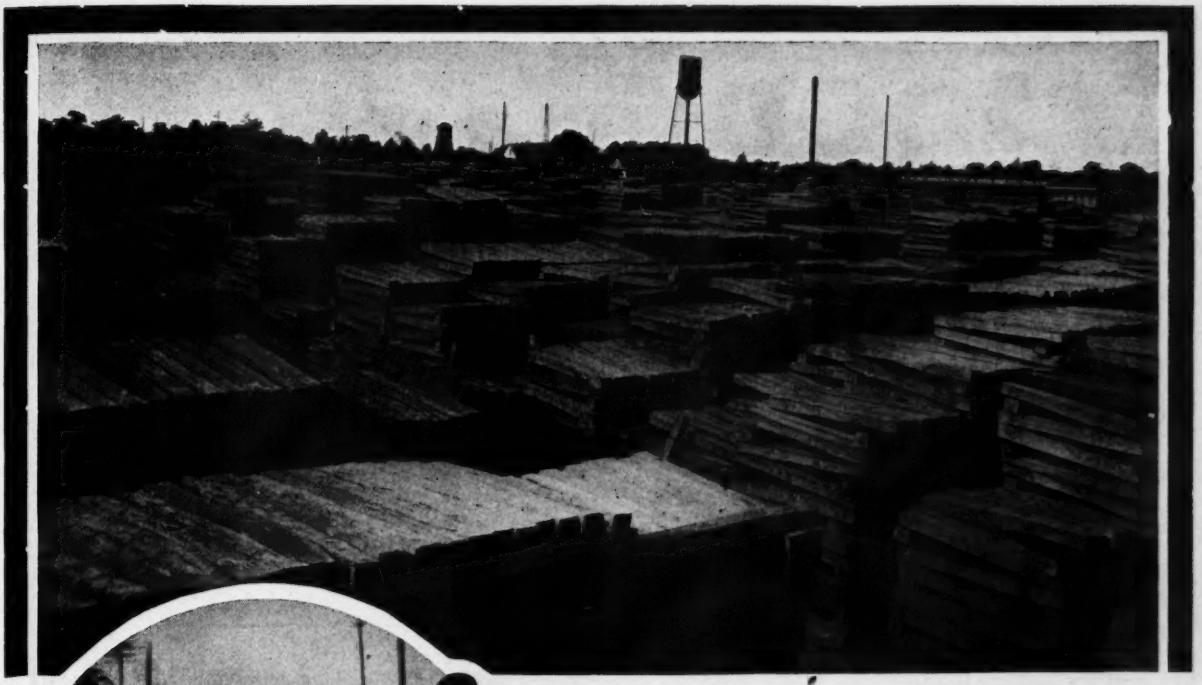
Home Office: 342 Madison Avenue, New York, N. Y.

Airco District Offices, Plants and Distributing Stations conveniently located throughout the Country.

Air Reduction Sales Company maintains its own Apparatus Repair Shop in each Airco District Office City.



"Airco Oxygen and Acetylene Service is Good Service."



Standard Specification Ties Reduce the Cost of Renewals

The cost of tie renewals constitutes the largest single item of maintenance of way expense. The importance of scrutinizing this expenditure closely is thereby self-evident. HOW, WHERE and FROM WHOM your ties are purchased are vitally important questions for you, worthy of checking up. It stands to reason that haphazard buying or competitive bidding at railroad sidings for ties which are not piled orderly and clearly visible is more or less of a gamble. If you pay the grade 5 scale price for ties which are virtually no more than grade 3, you are not investing your "Tie Renewal Dollar" to the best advantage.

There is one sure way to obtain maximum tie life—more timber and sounder tie service—and that is to INSIST on Standard Specification Ties at all times by insisting on an orderly stacking and a strict enforcement of A. R. E. A. Specifications, but the easiest way is to "tie up" with an organization which specializes in standard specification ties.

You can get them from the International Plants—all I. C. C. Co. Ties are carefully stacked in open piles so that they are easily visible, the grade is marked on each tie with paint, and each tie is permanently identified with the I. C. C. Co. dating nail. They are always standard specification ties.

Let us figure on your 1924 requirements

The I.C.C.Co. Dating Nail permanently identifies the ties that last longest.

International Creosoting & Construction Co.

General Office—Galveston, Texas

Plants: Texarkana, Texas Beaumont, Texas
Galveston, Texas

International TREATED TIES

GOOD for a new job after 14 Years -

"No deflection"

"Absolutely sound condition"

"To be Installed again"

SOUTHERN PUBLIC UTILITIES CO.
Greenville, S.C.

Mr. H. L. Harris,
Dixie Culvert & Metal Co.,
Atlanta, Ga.

My Dear Mr. Harris:

The Armco Culvert we removed in March, 1923, had been in continuous service since 1909. The culvert was in absolutely sound condition, practically no deflection being noticed in its entire length of 35 feet.

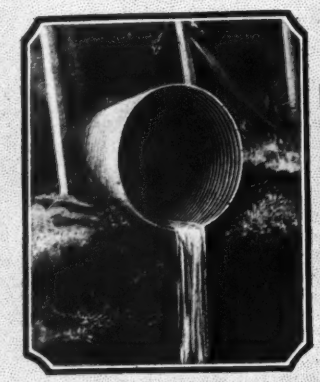
It has carried not only our street railway traffic, but heavy freight cars of 100,000 pounds capacity have passed over it almost daily during the past few years.

We removed the culvert to increase the size of the opening, an error in engineering in the original installation calling for 12-1/2 foot opening instead of the 30 foot opening which is really necessary. We expect to install this old culvert at another location and in my opinion we should be able to get at least 20 years additional service out of it.

From my experience I can highly recommend your product.

Yours very truly,

(Signed) W. B. Ellis, Jr.
MANAGER.



ARMCO CULVERTS

Ingot Iron

There is a manufacturer in almost every state and in Canada, making Culverts, Flumes, Siphons, Tanks, Roofing, etc., of genuine, rust-resisting Armco Ingot Iron. Write for full information and nearest shipping point on products in which you are interested.

ARMCO CULVERT & FLUME MFRS. ASSN.
215 NORTH MICHIGAN AVE. CHICAGO

Better Track at Less Cost

Four men with Ingersoll-Rand Pneumatic Tie Tampers can tamp more track in one day and do a better job than twelve (12) to sixteen (16) men with hand picks and bars.

Furthermore, pneumatic tampers make a smoother, safer, and a more permanent roadbed that holds up over twice as long as hand tamped track.

Pneumatic Tie Tampers have demonstrated the ability to save labor and reduce costs for hundreds of users on all types of railroads, from the small feeder roads to the great trunk lines. Actual working figures on such installations are available and show positively the savings effected by Ingersoll-Rand Pneumatic Tampers.

Ask for copies of these reports.

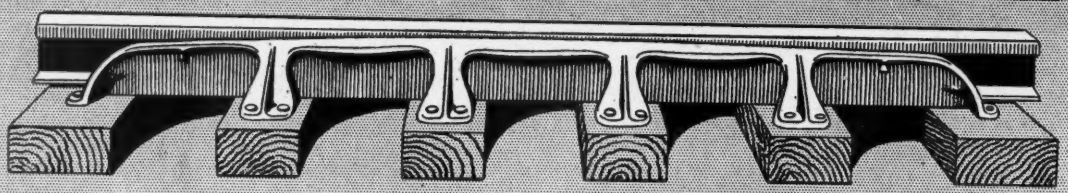
INGERSOLL-RAND COMPANY, 11 Broadway, New York

Offices in all principal domestic and foreign cities

For Canada refer Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal

180-TT

Ingersoll-Rand



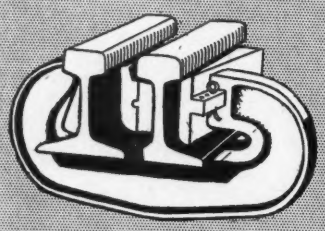
AJAX MANGANESE STEEL
ONE-PIECE GUARD RAIL

Ramapo and Ajax specialties have been long and favorably known under their individual names as manufactured by Ramapo Iron Works and Ajax Forge Company. These two companies are now consolidated into Ramapo Ajax Corporation, with five completely equipped works conveniently located for prompt deliveries to the railroads of the country. To assure service in the Western territory a stock of Ramapo Automatic Safety Switch Stands is carried at the Chicago headquarters.

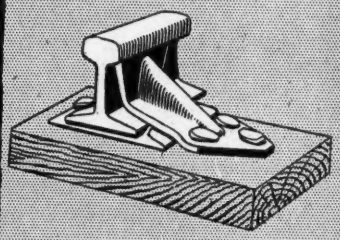
The Ramapo improved No. 20-B stand, placed on the market a year ago, has met with pronounced success. Repeat orders are coming in wherever it has been installed.

Other "RACOR" specialties not here illustrated include Switches, Frogs, Crossings, etc., Special Railway Track Work, Cast and Rolled Manganese Rail Construction, etc.

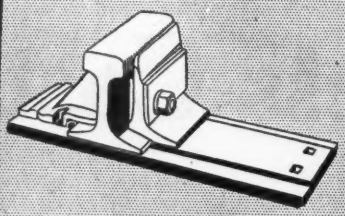
Particular attention is directed to the Ajax One-Piece Guard Rail at top of this page. Its combined simplicity and rigidity make this the most efficient and economical installation.



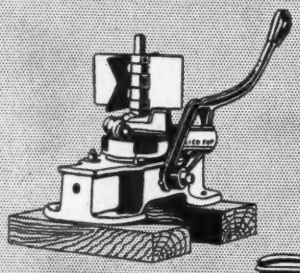
RACOR FORGED
HEAVY DUTY
GUARD RAIL CLAMP



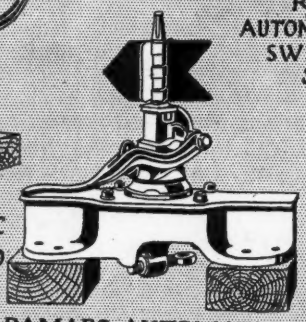
RACOR
FORGED RAIL BRACE



RACOR DOUBLE SHOULDER
SOLID BOTTOM
SWITCH RISER PLATE



RAMAPO AUTOMATIC
SAFETY SWITCH STAND
Style No 20-B



RAMAPO AUTOMATIC
SAFETY SWITCH STAND
Style No 19

RAMAPO
AUTOMATIC SAFETY
SWITCH STAND
Style No 18

RAMAPO
AUTOMATIC SAFETY
SWITCH STAND
Style No 17

RACOR

RAMAPO AJAX CORPORATION

RACOR

HILLBURN · NEW YORK

This Company is a consolidation of Ramapo Iron Works and Ajax Forge Co.

2503 Blue Island Ave.
CHICAGO
Mc Cormick Building
CHICAGO

30 Church Street
NEW YORK

NIAGARA FALLS, N.Y.
SUPERIOR, WIS.

Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

AMERICAN
TRADE MARK REGISTERED U. S. PAT. OFFICE

"American" Pumps Reduce Labor Overhead

For instance, the "American" deep well plunger pump illustrated, which supplies water for the Illinois Central Railroad Tank at Flossmore, Illinois, is manually operated, but is designed to automatically shut off by means of a float control. *Constant attendance is not required.*

Let our engineers consult with you—they have many years of everyday, practical experience in railway pumping problems.

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SAN FRANCISCO, CAL.	CHARLESTON, S. C.	ST. LOUIS, MO.	CALGARY, ALTA., CANADA
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THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
FIRST NATIONAL BANK BLDG.

1/3 more per dollar

DUMORITE has cut blasting costs in many kinds of work. Its economy has been proven the country over.

Dumorite has approximately the same strength, stick for stick, as 40% dynamite, running 135 to 140 sticks to the case; as against 100 for "40%." The case price is the same.

Write our nearest branch office outlining your requirements, and you will receive full information on Dumorite as applied to your particular explosive problems.

E. I. DU PONT DE NEMOURS & CO., Inc.

Explosives Department

Wilmington, Delaware

Branch Offices: Birmingham, Ala., Boston, Mass., Buffalo, N. Y., Chicago, Ill., Denver, Colo., Duluth, Minn., El Paso, Tex., Huntington, W. Va., Kansas City, Mo., Mexico City, Mex., New York, N. Y., Pittsburgh, Pa., Portland, Ore., St. Louis, Mo., San Francisco, Cal., Scranton, Pa. Seattle, Wash., Spokane, Wash., Springfield, Ill.

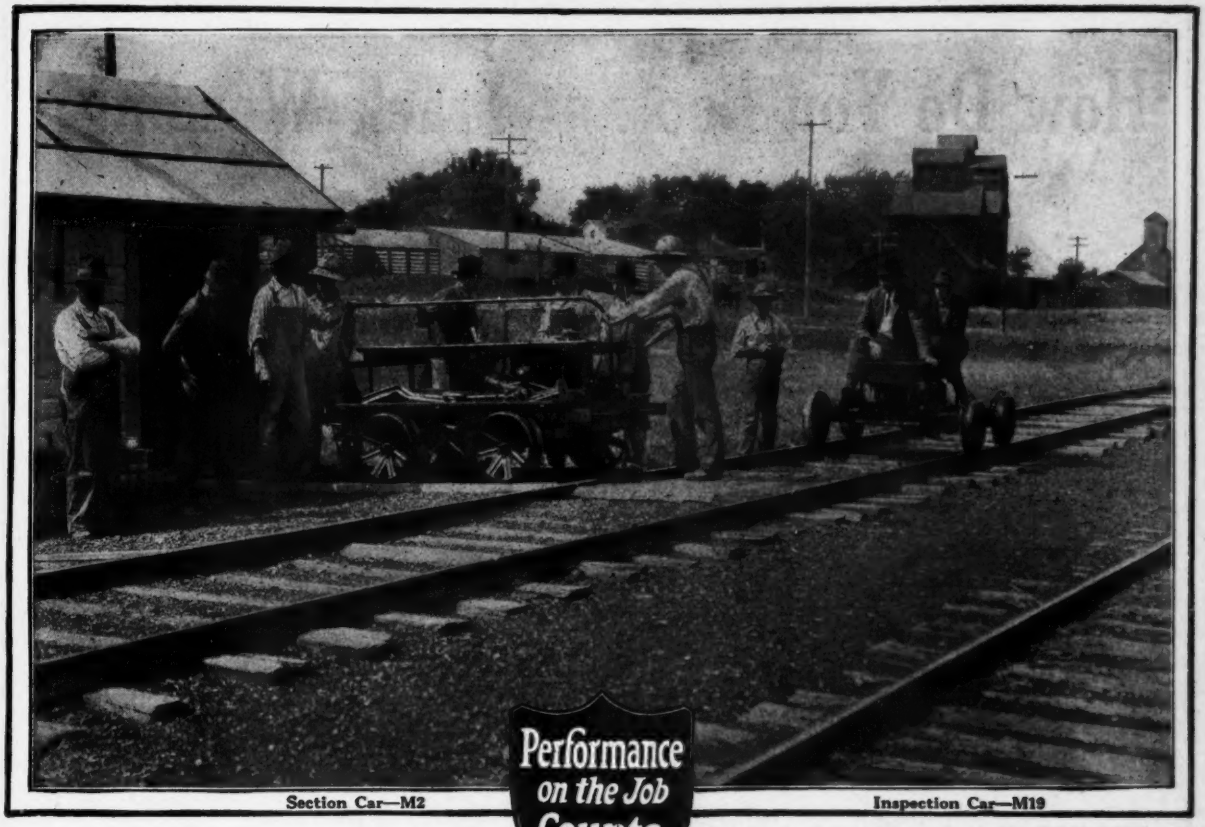
Du Pont Products Exhibit, Atlantic City, N. J.

NON-HEADACHE DU PONT NON-FREEZING

DUMORITE

THE LATEST OF A COMPLETE LINE OF DU PONT EXPLOSIVES

Nitroglycerin, ammonia, gelatin and other types of explosives designed to meet every blasting requirement at least expense.



Performance on the Job Counts

FAIRMONT *the Pioneer*

Over a period of years Fairmont has pioneered a long list of original improvements in railroad engines and motor cars. From the start, a practical grasp of railroad conditions has enabled Fairmont Engineers to anticipate each changing need and meet it with equipment of greatest efficiency and economy.

Fairmont Was First to Design and Successfully Develop

1. Free Engine type of motor car using the Sliding Base Engine mounting.
2. Throttle fuel control (eliminating large fuel waste).
3. Non-friction type (ball-bearing) mounting of engine crankshaft bearings.
4. Non-spattering closed type water jacket.

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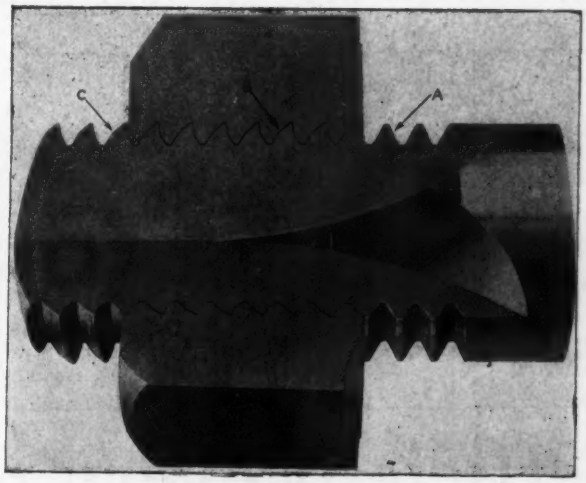

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Selflock track bolts are the only tight fitting bolts that lock tight on every thread. That is the vital difference from ordinary bolts.

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Railway Engineering and Maintenance

Volume 19 August, 1923 No. 8

THE DISTRIBUTION OF CROSS TIES

SINCE one dollar of every eight spent for maintenance of way goes for cross ties and for labor required for their insertion it is difficult to understand why their use has not received more attention from those responsible for the upkeep of the tracks. No other single expenditure for maintenance of way and structures approaches it in magnitude and no other single item offers as great opportunities for economies. We have referred at length in these columns to the importance of properly developing and enforcing specifications to insure that only ties of the proper quality are purchased. We have also given much space to information demonstrating the economy of timber treatment. There are, however, other phases of the subject which are of scarcely secondary importance, and prominent among these is the careful distribution of these ties, in order that they may be placed where they will render the most economical service.

The roads give much attention to the preparation of their rail laying programs in order that the new rail may be placed where it will effect the greatest improvement in riding conditions. Scarcely less attention is given to the allocation of the rail released from these tracks in order that it may be relaid on secondary main lines, releasing other rail which, in turn, is sent to branch lines. The detail with which this program is prepared is justified and the roads are to be commended for the pains thus taken although the total amount involved is only a fraction of that expended for ties. In spite of this fact, no such detailed attention is given to the distribution of ties, although they vary far more widely in characteristics than rail.

Ties are purchased from a wide variety of woods. They are of varying sizes and strengths, they are subjected to different preservative treatments or to no treatment at all, and the decay producing conditions to which they are subjected in track vary widely as does the traffic which they are called to support. Obviously with such a diversity of conditions some ties are better adapted to meet the requirements of certain lines than others. In a crude way most section foremen attempt to place their largest ties and those of the strongest woods on curves and under joints. In a few instances some consideration is given this subject in distributing ties among various lines. However, the roads on which ties are distributed in any systematic manner are few. The Central Railroad of New Jersey placed in effect several years ago a comprehensive plan for the distribution of its ties.* One or two other roads have developed less thorough plans. More recently, the Atchison, Topeka & Santa Fe has evolved a comprehensive plan for the distribution of ties over its entire system, as described elsewhere in this issue. This plan, and those to which reference has been made, deserve careful consideration. Under present conditions the average annual cost of a tie in track exceeds 20 cents. If the average life of all ties can be extended only one year by distributing them so that they will render greater service, a saving of great magnitude will be obtained.

*Railway Maintenance Engineer, August, 1920, Page 300.

GIVE PAINT SPRAYING A FAIR TRIAL

THE YOUNG MAN who has been reading law in his uncle's office for some 30 days, was asked what he thought of it, and replied, "I don't like it. I'm sorry I learned it." This attitude would appear to exemplify the position manifested by some railway officers towards the use of the paint sprayer on bridges and buildings. Inquiries concerning the experience with this equipment disclose that while many roads have made experimental use of the sprayer on railway structures, few of them have adopted it as regular equipment. But in view of the scarcity of definite facts concerning the reasons for abandoning the sprayer, it would seem that the experiments have been conducted in a more or less perfunctory fashion.

Failure to secure that degree of success with the equipment which would lead to its general adoption may be ascribed to several conditions. It is entirely possible that the trials were not accorded adequate supervision by either the manufacturer's representatives or the railway maintenance officers. It is well known that inadequate supervision of such experiments with any mechanical equipment is an almost certain cause of failure—failure either to obtain success or failure to elicit those facts which will show conclusively why the equipment was not a success.

Supervision by the higher officers or the manufacturer's representatives is particularly necessary in the case of the paint sprayer because of the natural opposition of the painter and his immediate superior, the foreman, who, taking pride in their handicraft, derive no little pleasure in the wielding of the brush. "I like to see the paint brushed in," is a common expression among them. On the other hand, there may be certain defects in the equipment as applied to the painting of bridges and buildings which have militated against success, but which can be overcome if adequate efforts are made to determine what these defects are in the course of well-conducted experiments.

Spray painting of railway freight cars is an established practice well beyond the experimental stage. In that work the sprayer is now recognized as a practical utility for the saving of time, money and labor. Much of the painting done on railway structures, particularly on the thousands of small buildings maintained by the railroads at their stations and terminals, are of a type the painting of which demands no higher standard of refinement than that required in the coating of freight cars, and if the

paint sprayer can be applied to the painting of these buildings with economy equal to that obtained in similar work on cars, it should by all means be used. If the device is defective, the shortcomings should be corrected. If it is basically impractical, it should certainly be abandoned, but until these facts are definitely known, railway building and bridge maintenance officers are under an obligation to conduct experiments which will bring out the truth.

THE VALUE OF APPEARANCES

At this season of the year when betterment work is at its height it is particularly difficult to maintain the station grounds and right-of-way neatly. Ballasting and rail laying operations, bridge reconstruction and other improvement work of necessity require the distribution of materials along the track, and their presence tends to disturb the orderly appearance of the property. More serious, however, is the natural tendency of the forces to neglect to remove or level off surplus material such as ballast and concrete aggregate or to destroy or remove old timber in their haste to move on to the next work. While it is not the intention to advocate that these forces should spend any considerable amount of time in clearing up the debris resulting from their operations, a large part of the objectionable conditions can be corrected with the expenditure of little time. Furthermore, unless this tendency is curbed it will increase until the entire property will present an unkempt appearance.

The objections to this tendency are twofold. In the first case, the traveling and shipping public naturally judges the efficiency with which a property is operated by its appearance. A lack of attention to neatness is commonly taken to indicate similar laxity in operation, with the result that the public is prone to travel and to ship over those lines which present the best appearance and give indications of being best maintained.

The effect on the employee is also to be considered. A disregard of those details of work which add to appearances invariably leads to slovenly habits of work which detract from the quality of the work. Nothing increases the morale of forces and creates in them a pride in their work more than attention to details of this character. The foreman whose right-of-way is neatly kept will almost invariably be found to have good riding track, while the roadmaster whose division is well policed will be found to have a group of live foremen who take an interest in their work and a pride in their sections. While the results of attention to appearances are intangible, they are nevertheless real and should not be lost sight of in the endeavor to complete the big program which is now confronting all maintenance forces.

THE RAILWAY PROBLEM

The necessity for the early adoption of some program to place the railroads on a sound basis is so pressing as to make it a matter of deep national concern. There is no other issue of greater importance, for herein lies in large part the solution of the agricultural problem, and with it the assurance of our industrial position.

No thoughtful sentiment in America will tolerate the financial ruin of the railroads. But the people do wish, now that exploitation has been ended, to have their transportation adequate to the country's needs, and desire all our facilities brought into efficient service. They wish to make sure of ample agencies, and they demand the least carrying charge which will make an adequate return to capital and at the same time permit extensions and additions and enhanced equipment essential to the best transportation.

There are today very insistent advocates of government ownership. Frankly, I do not share their views. Our political system has not reached a state of development where we can insure proper administration. I believe it would be a colossal blunder which would destroy initiative, infect us with political corruption, create regional jealousies and impose incalculable cost on the public treasury.—

From an address by President Harding at Kansas City, Mo., on June 22.

HOW MAINTENANCE MEN CAN AID IN HANDLING TRAFFIC

During the month of June the number of cars loaded with revenue freight on the railways of the United States not only exceeded those for that month in any previous year by a large margin but they also exceeded those for any previous month in history. For four consecutive weeks they exceeded one million cars and for the week ending June 30 they established a new weekly record with the loading of 1,021,770 cars. This record was established during what is normally a period of relatively light traffic just prior to the beginning of the grain movement. With the large crops now being harvested it is to be expected that this traffic will add more than the normal seasonal increase to the already heavy business.

This condition gives emphasis to the American Railway Association's program formulated last spring for the handling of this peak load. While the maintenance of the cars and locomotives with which this traffic must be handled is the problem of the mechanical department and the movement of the cars is an operating problem, the maintenance of the tracks and structures over which this traffic moves is the function of the maintenance of way department. This branch of the service, therefore, bears a very vital responsibility to the successful carrying out of this program.

Among other measures, the A. R. A. program included a provision that "the use of power and equipment for construction and maintenance purposes be restricted to the minimum after September 1 in order that the maximum of power and equipment may be available for commercial purposes." The maintenance of way department normally uses a relatively large number of cars and engines during the active summer season for the hauling of ballast and for other activities commonly conducted by work trains. Of late, the rapidly rising cost of train service has caused many men to look for more economical methods and numerous expedients have been developed. Now the consideration of economy is supplemented by that of necessity for the conservation of equipment.

The maintenance of way department can also facilitate the movement of trains in many other ways, among which may be mentioned the elimination of conditions tending to cause derailment, the avoiding of the necessity for slow orders, etc. There are still other ways in which maintenance officers can co-operate with other departments in moving the peak traffic and therefore aid in promoting the welfare of the entire country and in demonstrating to the public that private management

and private initiative can meet the test of the heavy overload.

Because of the importance of the problem immediately before the railways, we announce a contest on the subject, "How the Maintenance of Way Department Can Assist in Handling a Peak Load Traffic." We will pay $25 and $15 for the best and second-best papers submitted, the prizes to be awarded on the basis of the practical value of the suggestions offered in meeting the situation this fall and on the thoroughness with which this subject is treated. Owing to the importance of giving early publication to these papers, they will be printed in the next, or September, issue. Therefore, only those papers will be considered which are received on or before August 20. All contributions should be sent to the editor of *Railway Engineering and Maintenance,* 608 South Dearborn street, Chicago.

MODERN SCIENTIFIC STUDIES CALL FOR NEW TRADE METHODS

BRIDGE and building work employs crafts whose beginning is as old as history. The carpenter of today is but a successor to the carpenter of Nazareth. The modern stone mason possesses trade knowledge built up by his predecessors in the creation of the wonderful cathedrals of the Middle Ages. It is natural, therefore, that these men feel that there is little to be learned from the modern engineer or scientist who has not even taken the trouble to become a member of his craft through the serving of a regular apprenticeship. But, even in timber framing, modern studies of mechanics demonstrate how wasteful in the strength of timber was the practice of notching and mortising followed by our grandfathers in the construction of their stanch barns and houses. More recently, the introduction of timber treatment has called for the adoption of new methods in the handling of wooden structures to prevent that needless cutting which will rupture the sheath of impregnated timber so necessary to the effectiveness of the preservative.

But it is in the introduction and use of portland cement that the man in charge of bridge and building work most frequently runs counter to the age-old practices of the skilled crafts. Even now after concrete has been a commonly used building material for 30 years, it is difficult to make workmen distinguish between the practices to be observed in the use of lime mortar and those necessary for good results with cement. Only a few days ago, conversation with a concrete sidewalk builder who is credited with being an excellent workman developed the fact that he had never heard that there was any virtue in protecting his work from the sun and air to prevent the rapid evaporation of the water so necessary for the chemical action of the cement.

The difficulty encountered in this connection lies in the fact that good practice in the making of concrete as with the use of treated timber, is a matter of scientific study and the manner of presenting this information to the workmen must necessarily come from outside of the trade and therefore conflicts with the ancient and honorable custom of passing trade knowledge from master craftsman to apprentice. This is a perplexing problem for railway supervisory officers.

MORE EMPLOYEES—The employment on class I steam roads was greater in the month of April, 1923, than in any month since the new classification became effective in July, 1921, according to the monthly summary of wage statistics compiled by the Interstate Commerce Commission.

Letters to the Editor

CONCRETE DITCHES THE SOLUTION OF THE TRACK DRAINAGE PROBLEM

Freeport, Ill.

TO THE EDITOR:

It was my pleasure recently to see discussed in your "What's the Answer" department in the June issue of *Railway Engineering and Maintenance,* a question pertaining to the proper slope of roadway ditches, and to have contributed my views in answer to the question raised at that time. There is one point in connection with this subject, however, which, while outside of the question discussed, should also be mentioned. I refer to the building of permanent ditches.

I believe that the day is not far distant when ditches of a permanent character will be constructed. There is no one thing in railway maintenance of as much importance as a perfectly drained roadbed, not only to first class track conditions, but to economy in track work, because water is one of the greatest detriments to roadway. If it were possible to keep the roadbed perfectly dry at all times, or at least to get the water away from it at the instant it falls, it would mean a saving to the railroads greater than any labor-saving device ever invented. This can only be accomplished, however, by having ditches that will remain in first class condition all of the time, and the only way that this can be accomplished is to make them permanent.

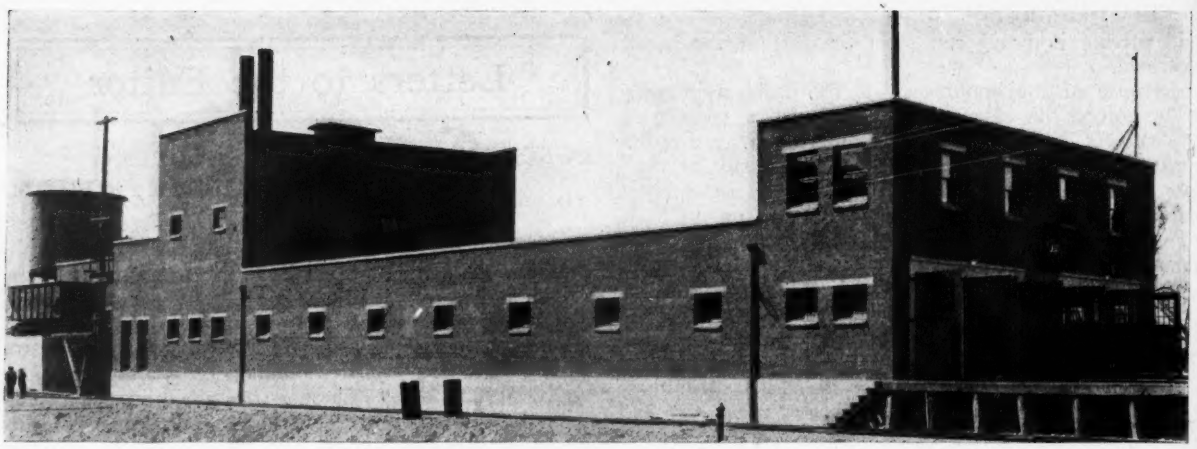
These permanent ditches may be of concrete, which could be constructed throughout the cuts and down the embankment at the end of the cuts to carry the water away from the embankment. In addition, the side wall of this ditch could be extended up the slope where it would also act as a brace to cuts having a tendency to slip. If the balance of the slope of the cuts is properly widened to fit the ditch and perfectly sodded so that as little soil as possible could wash into the ditch, a means will be provided whereby the water will be drained from the roadbed as rapidly as possible, and a system of drainage will be had which will be serviceable throughout all seasons of the year. The result will be a great saving in labor, not only in the upkeep of the roadbed, but also in the labor necessary each year under present methods to clean out and ditch cuts.

E. J. BOLAND,
Roadmaster, Illinois Central.

NEW BOOKS

Pulling Together.—By John T. Broderick. 167 pages, 5 in. by 7½ in. Bound in cloth. Published by Robson & Adee, Schenectady, N. Y.

Although this book appeared only a year ago, this edition is the sixth (forty-fourth thousand). The book portrays a discussion between the president of a large and well-known corporation in the middle west with a traveling salesman in the smoking room of a Pullman car regarding human relations in industry. In this conversation the manufacturer discusses the weaknesses of the present methods of dealing with employees and describes the merits of a plan of employee representation installed in his plant. Among the chapter headings which indicate the character of the contents are: Mutuality of Interest; How Good Will Is Won; Plan of Employee Representation; Our Friends the Foremen, and Need of Strikes Outgrown. The new feature of this the sixth edition is a short sequel entitled, "Untouched Wealth."



Permanence Was an Important Consideration in Developing the Design.

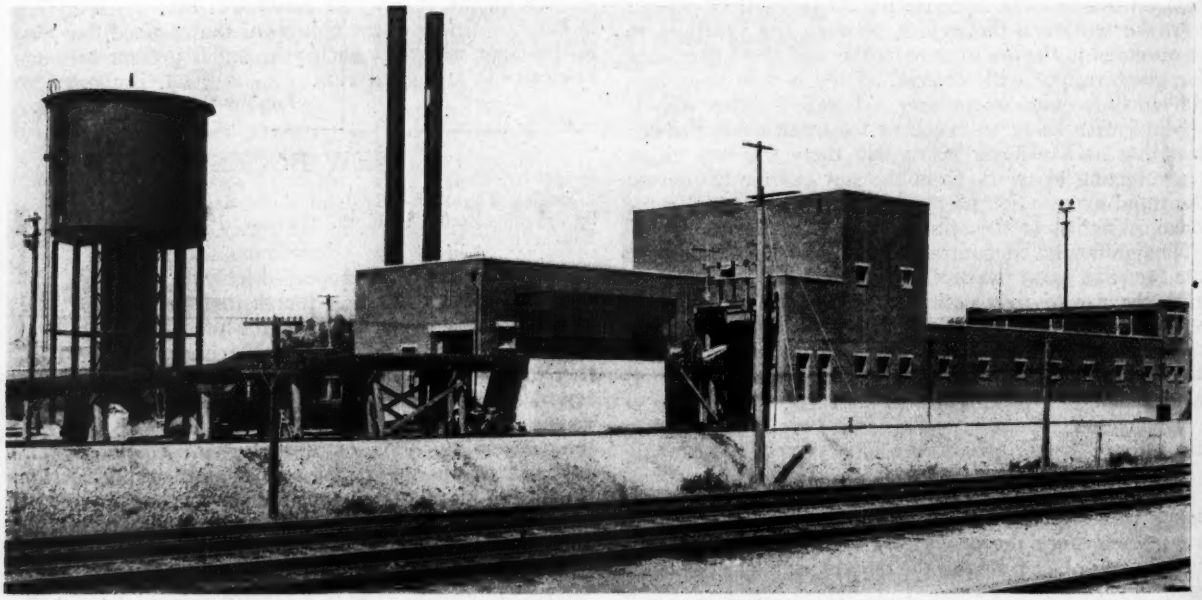
Treating Plant at The Dalles Embodies Permanent Construction

Substantial Structures, Well-Organized Equipment and Efficient Yard Layout Insure Excellent Results

A TIMBER treating plant designed along modern lines and providing for an ultimate development that will afford large storage and treating capacity was put into operation by the Union Pacific (O.-W. R. R. & N. Co.) at The Dalles, Ore., on May 25. It replaces a plant at Wyeth, Ore., which had to be abandoned because the site, low flats between the Columbia river and the adjoining bluffs, was of insufficient area to afford adequate storage space. Another pertinent reason for the change is to be found in the marked difference in climatic conditions at the two points, although they are only 35 miles apart. The Dalles has a rainfall of only about 16 in. per year, as compared with an average annual fall at Wyeth of about 72 in. This pronounced difference in precipitation is explained by the fact that The Dalles lies east of the backbone of the Cascade range, whereas Wyeth lies to the west of it. In addition to this advantage for The Dalles from the standpoint of the location of a yard for the seasoning of ties and timber previous to treatment, that location possesses an advantage in the fact that it has a population of about 6,000, thus comprising a much more attractive place for the employment of labor than Wyeth, which is little more than an industrial camp.

The new plant cost approximately $550,000, and as now equipped has an annual capacity of about 2,000,000 ties. It is arranged for the treatment of ties and timber by the zinc chloride process, but the design is such that only minor changes are necessary to adapt it to the use of the creosoting processes should it be found desirable to use creosote at any time.

The retirement of the plant at Wyeth has been effected



Coal Is Delivered to the Power Plant on a Trestle

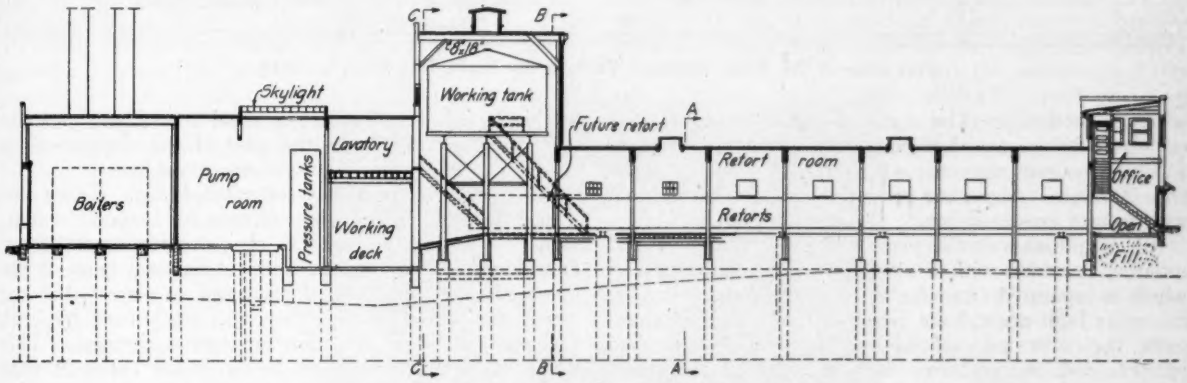
with small loss of investment to the railroad because the buildings involved are of an inexpensive character, while the retorts which were used at that point without housing have been moved to The Dalles and installed in the new plant. The retorts from Wyeth, four in number, are 6 ft. in diameter by 117 ft. long, but the retort room in The Dalles plant is of a size that will permit the installation of retorts 7 ft. by 135 ft., whenever it is desired to replace the old ones. As used at Wyeth, the old retorts each accommodated 14 trams that could be loaded with 30 ties 7 in. by 9 in. in section, but this capacity has been increased at the new plant by providing new trams with a special low frame construction which will take 35 ties.

The plant is designed for operation by the pneumatic or measuring tank process. Four pressure tanks, 6 ft. in diameter by 24 ft. high, have been provided, together with two 50,000-gal. working tanks supported on steel towers at an elevation 19 ft. above the retort floor. The pressure is supplied by a two-stage air compressor delivering 600 cu. ft. of free air per minute at a pressure of 125 lb. per sq. in. Two vacuum pumps of 420-cu. ft. rating have been installed, connected to condensers and interconnected to all of the retorts. All of the equipment is electrically operated so that the boiler plant, consisting of two 250-hp. water tube boilers, is provided only to supply steam for treatment requirements. The layout of the treating plant is such as to provide for one end operation of the retorts, the cylinders being charged and emptied from the doors at one end only. Therefore, the working deck and other auxiliary facilities, instead of occupying a space to one side of the retort room, abut on the closed ends of the retorts. As shown in the plan of the plant, the two working tanks occupy a clerestory over one end of the retort room, while the working deck, pump room and boiler room are arranged in the order mentioned at the rear of the retort room.

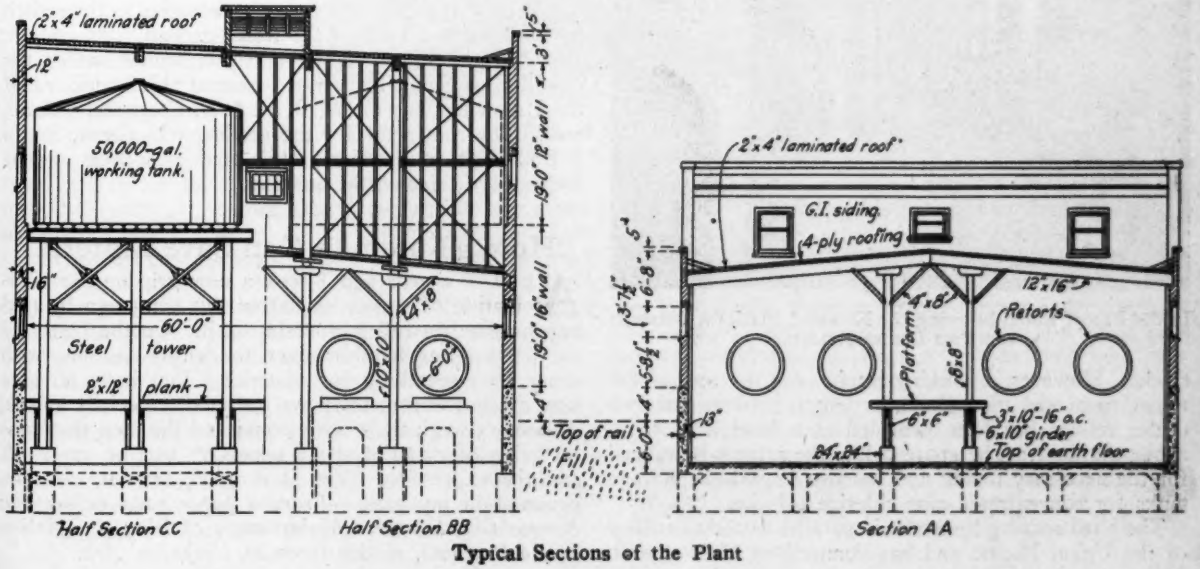
The new plant at The Dalles is located a mile east of the station on a site lying between the main tracks and the river, affording ample space for a storage yard with an ultimate capacity of more than two million ties. However, to prepare this site for use entailed filling to the amount of 220,000 cu. yd. of earth obtained from a pit 10 miles east. The yard is 6,500 ft. long and the average depth of the filling was about eight feet.

High grade construction affording a high degree of permanence is embodied in the building provided to house the new plant, which, as the plans show, encloses all of the tanks used in connection with the treatment, thereby effecting a material reduction in the heat lost through radiation. The building has hollow tile walls above the level of the window sills, below which the walls are of concrete. The roof is of laminated 2-in. by 4-in. timbers, on edge, laid upon wooden girders and covered with four-ply built-up roofing.

The foundations introduced a problem which was solved

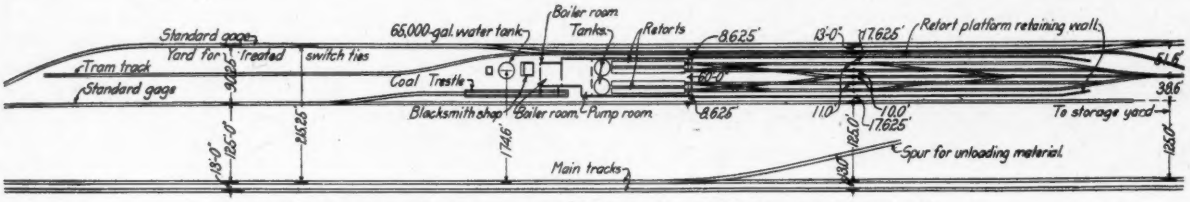


A Longitudinal Section Showing Enclosed Tanks



Typical Sections of the Plant

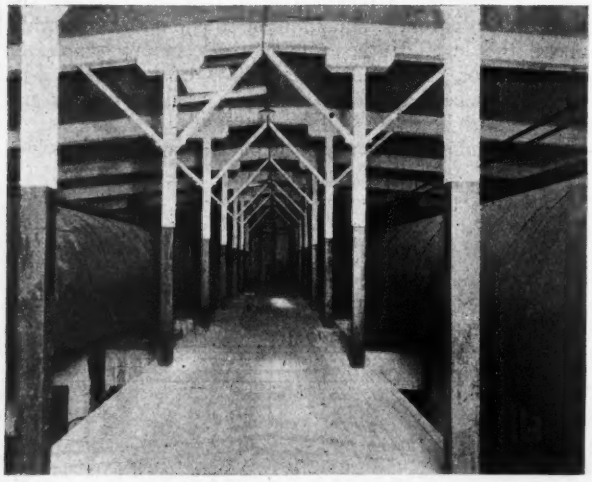
in an interesting manner. Not only was it necessary to cover the building site with a fill, but the natural ground to a depth of 12 ft. overlying rock is insecure material consisting of soft clay and sand, making it necessary to carry the foundation to the rock level. To do this economically, the foundations for the building walls, columns and retort supports were provided in the form of cylindrical concrete piers or caissons built inside of steel tubes 30 in. in diameter which were driven to rock with a pile driver. The material inside the tubes was excavated by means of pumping and after the concrete had been poured, the tubes were pulled so as to be available for reuse. Above the ground the piers were finished with square cross sections.



Part Plan of the Yard. Storage Yard to the Right Has Been Omitted

An examination of the plans will show that the retort room is provided with a vestibule on the outdoor end which is separated from the body of the retort room by tile walls built around the retorts. Under this arrangement, the outer doors of the building may be opened to receive or discharge trams without exposing the retort room to the weather. It will also be noted that a second story above the vestibule has been arranged as an office for the superintendent of the plant, the location being such as to afford an excellent view of the entire yard.

Another feature of the retort room to be noted is the fact that the filling was omitted inside the foundation walls, so that the retort room has an earth floor at a level about nine feet below the elevation of the retort tracks. However, a working platform at the rear of the retort room and throughout its length between the two center retorts has been provided at a level 7 ft. 6 in. above the floor. The space below the retorts is utilized for the necessary piping and for two 12,500-gal. storage tanks for concentrated zinc chloride solution.



In the Retort Room Showing the Elevated Platform Between the Two Center Retorts

The yard serving the track is parallel to the main line of the Union Pacific and has connections to it at each end, a feature of which advantage has been taken in designing the layout to effect the most economical operation. The grade of the yard is downward from the east toward the west and, therefore, the yard has been designed for the movement of all standard-gage cars and for the loaded movement of all tram cars to be in that direction. The storage yard, which is located at the east end of the layout, is served by two standard-gage tracks which are continued to the west on either side of the working yard, the treating plant and a small yard for the storage of switch ties to the west of the treating plant and thence to a connection with the main line.

No storage is provided for treated ties. These are loaded direct from the trams to cars for immediate shipment. The storage yard is also provided with three narrow-gage tram tracks with a hammer-head crane operated over two lines of rails and so placed that the crane stands astride of a three-rail track used by both the standard-gage and narrow-gage equipment. This crane has a reach sufficient to cover the entire storage width of the yard and is used to transfer ties from incoming railway cars to the storage piles and from storage piles to the trams. The tramway tracks in the storage yard converge at the west end into a single track leading to the working yard, where it again subdivides into four tracks leading to the respective retorts and provided with a system of crossovers, so that the two outside tracks can be used for unloading tram cars onto the two flanking standard-gage tracks, which are depressed four feet below the tram tracks at this point.

Under the plan of operation required with this layout, the incoming cars are unloaded in the storage yard, and then dropped down to the loading tracks where they receive treated ties from the trams and then pass out at the west end of the yard. One of the standard-gage tracks flanking the loading platform is provided with a third rail so that tram cars may have access to the switch tie yard, located west of the treating plant.

This plant was designed and constructed under the direction of Samuel Murray, assistant chief engineer of the Union Pacific (O.-W. R. R. & N. Co.), at Portland, Ore. The contractor for the grading was Grant, Smith & Co., of St. Paul, Minn., while Hedges & Huls of The Dalles, Ore., erected the building.

How a Foreman Can Save Material

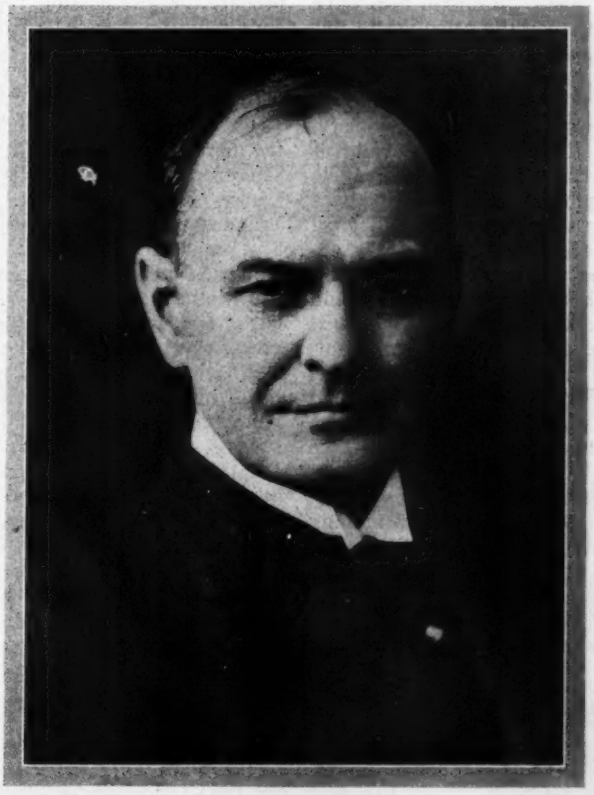
ABOUT a year ago I took a new grip on the elimination of waste. I started this campaign by taking my gang in full partnership in it. On the first raid we pushed our handcar over the entire section, with every man searching for material. You have no idea how much useful material we gathered, especially spikes. This day's work thoroughly convinced the men that conservation of material was a necessary part of our work and the expression, "Yes, it is good, save it," is now common in my gang.—*From a paper read before the Kansas City Southern Maintenance of Way Association by Ed Rowland, section foreman, DeQueen, Ark.*

What Can You Gain From Membership in Railway Associations?

President Lee of the A. R. E. A. Says You Will Benefit in Proportion to the Time and Thought Put Into the Work

By WALTER S. LACHER

"NO MAN in railway service can afford to forego the advantages of membership in one or more of the associations peculiar to his field. The value of such organizations as the Roadmasters, the Bridge and Building, and the American Railway Engineering associations is limited by no means to their technical discussions. Much of it is found in the inspiration derived by the members through active participation in the work. The younger men in particular, are especially benefited by the increased enthusiasm, widened acquaintance, and broadened outlook obtained in this way, and it is in recognition of this, that the American Railway Engineering Association has assumed definite leadership in extending to its younger members ample opportunities for an active participation in the work of the committees."



Edward H. Lee
President of the American Railway Engineering Association.

It is especially appropriate that this sentiment should be given voice by the president of this association, Edward H. Lee, vice-president and chief engineer of the Chicago & Western Indiana and the Belt Railway of Chicago, because he has ever manifested a keen interest in the young men in railway service and urged their active participation in association affairs. Being numbered among those who had to depend very largely on their own resources while gaining a technical education, he has always evinced sincere sympathy for young men in a like predicament and has frequently encouraged some young chainman or rodman in his organization to complete his college work. Not only has he been active himself in the affairs of both national and local organizations of engineers and railway men, but he urges his assistants to do the same.

Mr. Lee's particular convictions concerning the province of the technical association were first brought into prominence about ten years ago following his election as President of the Western Society of Engineers, an organization which has been remarkably successful in enlisting the interest of the young men, and while credit for this must be accorded to many of its members, to Mr. Lee belongs the distinction of having given the initial impetus to the idea at a time when it was not received with as general favor as it is today.

"Engineers, as a general rule," continued Mr. Lee, "are well fitted by natural endowment, training and experience to deal with material things, but they are too often less qualified to deal with men and their motives. In the early days the difficult problems of railroads were largely those brought about by natural conditions. They concerned their construction and operation over mountains, plains and deserts without much precedent to serve as a guide. But more and more conditions have changed, so that now the more difficult problems grow out of human relationships. Problems now demanding answers are those internal to the railroad organization, such as the creating and maintaining of morale, the wise control of labor conditions and the securing of a fair output for the payroll expenditure. There are also problems external to the organization such as the creation of public opinion that will recognize what the railroads have done and are doing for industry, an attitude of the public mind that will therefore be sympathetic and favorable to the railroads. Engineers built our railroads; they must develop themselves to handle the new and broader problems now confronting the roads.

"Association and committee work is valuable to railroad men in proportion to the well directed thought and time put into it, because through personal contact with other men interested in like activities the process of education is continued, experience is broadened, and new friendships and acquaintances are secured."

"Mr. Lee, many young men hesitate to join associations or take part in their work because of the expense. Can you give any direct personal benefit that would justify that expense for a young man with a limited salary?"

"Yes. Let me answer you indirectly. Compare the usual organization of a manufacturing industry with the

personal program of the railroad man who has sufficient ability, ambition, and initiative, to climb beyond the lowest rung on the ladder of promotion. The manufacturing industry has a purchasing and stores department to provide suitable supplies and materials for production, a production department to provide output, a sales department to provide a market for the output, an advertising and publicity department to enlarge its market and to create and foster public opinion favorable to the industry and its product. So the brains, education, and experience of the railroad man supply the equipment and material for his output of work from day to day. The sales end of his life work must be through the good will and friendship of his superior officers. Further, like an industry, he should have an advertising and publicity subdivision of his personal endeavors. One of the best means of gaining that end is through the work of railroad associations and their committees. What a young man needs is friends and more friends, a wider and wider circle of acquaintances among those who may have it in their power to offer him a helping hand. Railroad men have too often given no attention or too little attention to this phase of their personal programs."

"Isn't the same true of railroads themselves?"

"Perhaps the railroads themselves have paid too little attention in the past to wise advertising and publicity, but there are present indications that many railroad leaders are realizing the advantages of a favorable public opinion and that they are adopting means and methods of educating the public to the fact that unprecedentedly good service is now being furnished, rather than to rely entirely upon letting this good service speak for itself. So the railroad man in living out his personal program should realize that good work is imperative, but that personal publicity through friends and acquaintances is also important."

"I think that every young engineer and railroad man who has brains and ambition should read the address of Captain Robert W. Hunt upon the occasion of the presentation to him of the Washington Award of the Western Society of Engineers, published in the Journal, W. S. E., July, 1923. He was a man of outstanding success and his last public utterance was an unconscious testimony to the great value of friendship. It included with these words:

" 'Gentlemen, I have been blessed beyond expression by loyal friendships.' The address further showed that one of his principal means of building up and holding friendship and acquaintance was by joining in the work of associations allied to his life work.

"Memberships in associations, either national or local, extends a man's horizon. He gets a chance to see things in a broader way than is possible from the limited viewpoint of his individual experience. If he enters actively into the work he will be afforded new opportunities for the development of his individuality and for widening his acquaintance. This is particularly true of committee work which throws him into intimate contact with men of like interests on many other railroads besides his own. It helps him in his work and brings him opportunities."

"What kind of committee work will do a man the most good, that dealing with problems relating to his own regular employment or something with which he is not so familiar?"

"To arrive at a proper answer to that question, you must keep in mind the primary object for which the committee work is carried on, which is to study and prepare the best possible report on the subjects assigned. This requisite cannot be fulfilled unless the personnel of the committee consists primarily of men especially qualified, by training and experience, to deal effectively with the matter in hand. While a secondary object is to afford the members opportunity for self-improvement, the first requisite must receive primary consideration. Therefore, any one who applies for a place on a committee, say in the A. R. E. A., should expect to be assigned to the one on which he is best fitted to serve. The important thing is to have an active part in the work and usually it will be no trouble to get plenty to do.

"Another advantage to accrue from association work is the opportunity it affords a man to develop his latent powers. Men are not all alike, they differ greatly both as to mental capacity and executive ability and I cannot think of anything so misleading as to tell a group of young men that they all have an equal probability of success. The opportunity, of course, is the same for all, but they are by no means all equally qualified to take advantage of it. This applies particularly to the quality of leadership which is something that must be born in a man; he can't acquire it if it isn't there, but he may have unsuspected latent qualities of leadership that can be developed. Men often have latent ability of one kind or another and every man owes it to himself and his railroad to learn what his powers are and develop them."

Tie Yard at the Pocatello Timber Treating Plant, Union Pacific

Santa Fe Distributes Ties According to Service Requirements

Has Developed Plan to Select and Place Timber Where It Will Afford Maximum Economy in Use

THE Atchison, Topeka & Santa Fe has recently put into effect a comprehensive plan for the distribution of its cross ties in order that they may be placed in those tracks where they will render the most economical service. With 11,700 miles of lines and more than 17,700 miles of tracks in 13 different states between Chicago and the Pacific Coast, the tie requirements are large, while the climatic and track conditions to which they are subjected vary widely. This plan has for its object the distribution of the ties so that they will be inserted in those tracks for which they are best adapted. The tie supply of the Santa Fe comes principally from four producing areas, namely: the yellow pine district of eastern Texas and western Louisiana; the mountain pine of Arizona and New Mexico; the Douglas fir of the northwest and the California redwood and cedar.

The plan which has been developed for the distribution of these ties is the result of a detailed study of the supply and the service requirements of the road by a committee appointed by the operating vice president. This committee consisted of the assistant chief engineer of the system and representatives of the four general managers and of the store and timber treating department.

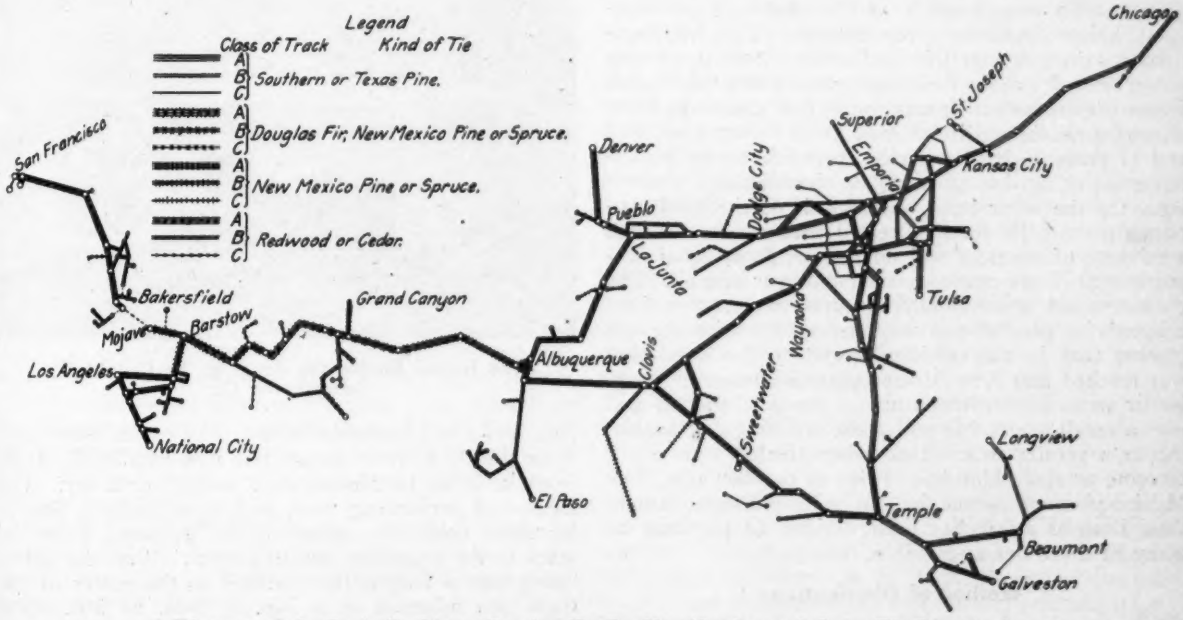
Tracks Classified According to Traffic

As the first step in the development of this plan all tracks on the system were classified in three groups, according to the amount and character of the traffic which they handled. These groups have been designated as: (1) Class A track, important heavy traffic, main lines; (2) Class B track, unimportant main lines and heavy traffic branch lines, and (3) Class C track, light traffic branch lines.

Because of the marked effect of climatic conditions and particularly of the amount of rainfall on the life of ties, statistics were then compiled of the normal annual rainfall on the system by operating divisions. This rainfall varies from a minimum of 5 in. on the Arizona division to a maximum of 50 in. on the Beaumont and Galveston divisions. Those divisions with a normal annual rainfall of less than 20 in. were classified as dry districts and those with more than this amount as wet districts.

Three Grades of Ties Established

The Santa Fe has not adopted the standard tie specifications or grading of the American Railway Engineering Association, but all ties have been classified between No. 1, No. 2 and culls and rejects. No. 1 ties include



A Diagram of the Santa Fe Lines Showing Traffic Classification and Cross Tie Distribution

6 in. by 8 in., 7 in. by 8 in. and 7 in. by 9 in. hewn and sawed ties of all woods. Number 2 ties include sound hewn and sawed ties of all woods slightly under 6 in. by 8 in. measurements and those rejected as No. 1 on account of slight defects. The No. 2 ties are, therefore, equal to the No. 1 ties in quality of wood and are given the same treatment, the difference being in size. It is expected that the No. 2 ties will give approximately the same service life as the No. 1 ties when used in lines of lighter traffic. In allocating the No. 2 ties to certain lines, an effort was made to provide an outlet for such ties of this grade as it is necessary to take as a by-product incident to the economical purchase of No. 1 ties rather than to encourage the use of smaller ties. The committee expressed the

opinion that a tie 7 in. thick with a 9-in. face was desirable.

Special attention was given to the distribution of hardwood ties, which, prior to the development of this plan, had been used indiscriminately on tangents and curves alike as long as the supply lasted. A survey of the purchases of recent years showed that it was possible to secure somewhat over a half million hardwood ties annually. A tabulation of the amount of curvature on the system showed 1,984 miles of curves on running tracks on main and branch lines. Of this 634 miles are on curves of less than two degrees. On the basis of the 12-year life of hardwood ties on curves a sufficient number were in sight to justify the committee in requiring that they be inserted in (1) all running track curves of two degrees and over, (2) engine leads and other important tracks in yards, (3) sharp curves in industrial and side tracks, particularly where they are located in paved streets, (4) on short tangents between curves on mountain grades on Class A track. Of the hardwood ties, gum has seemed to give the most satisfactory service in the semi-arid territories from the fact that it resists checking. For this reason the committee instructed that the quota of hardwood ties for the Coast lines be filled with gum ties as far as possible.

Treatment Was Considered

In developing its recommendations the committee also gave careful consideration to the character of treatment which should be given the ties. This investigation was primarily on the road's own extensive records of service of various kinds of woods treated with different preservatives. It was found that zinc-treated ties showed a maximum life of nine years in wet territories and 11 years in dry territories, their failures in the latter areas being due to excessive checking and shattering. On the other hand, the records of the road support a 16-year life for ties treated with creosote or with a mixture of creosote and oil ranging from equal proportions to 70 per cent creosote and 30 per cent oil. The creosote and creosote-oil mixtures were, therefore, adopted for general use over the system with the exception that in the semi-arid territory the conclusion was reached that New Mexico pine or spruce or Douglas fir treated with a mixture of creosote and oil will give a much longer life and resist checking and brooming to a greater extent than when treated with either creosote or zinc chloride. Owing to the fact that New Mexico pine and spruce ties can be bought more cheaply than Douglas fir it has been decided to purchase as many of these ties as possible.

Method of Distribution

Based upon these conclusions, the following assignment of ties has been determined upon:

For Class A track, No. 1 ties, either hewn or sawed, of 7 in. by 8 in. cross section or larger.

For Class B track, No. 1 ties, either hewn or sawed, of 6 in. by 8 in. cross section or larger.

For Class C track, No. 2 ties, either hewn or sawed. Culls and rejects will not be treated and will be furnished only on special requisitions for use in temporary tracks and in emergencies. Number 2 ties will be used in industrial tracks whenever possible, in order to keep their cost down.

In order to make this plan effective the local officers of each division will make a detailed inspection of all ties in their tracks in the late summer or early fall, from which they will prepare an estimate of the ties required for renewals in the following calendar year, classifying separately the number of ties of each grade and the hardwoods required. These division estimates will be assembled in the general offices, so as to reach the purchasing and stores departments not later than November 1. In filling requisitions, ties will be consigned to the roadmaster, who is held responsible for their use in the localities for which they were ordered. In case the class and size of tie required is not available, the next higher class or size will be substituted.

Making the Handling of Frogs Easier and Safer

ABOUT a year ago it was found necessary to change out all the radial frogs at a turntable of the Missouri-Kansas-Texas at Parsons, Kan. The peculiar construction of the new frogs was such that it was practically impossible to handle them with rail tongs, while the frogs were so heavy that it was impossible to get enough men around them to pick them up and load them onto a railway push car. When skidding was resorted to, it required 12 to 14 men with lining bars to move the frogs across the radial tracks to the turntable and again from the turntable into position in the track.

A solution of the difficulty was found in the use of

The Hooks Enable the Frogs to Be Caught Up Beneath the Car

four hooks in connection with a push car as illustrated. With the aid of these hooks, two men handled 2,700 lb. frogs in 10 or 12 minutes each without difficulty. The method of performing work with these hooks is first to lay skids (old rails answering the purpose) from the track to the frogs and greasing them. With the aid of lining bars a frog is then skidded to the center of the track and balanced on a 5-in. by 5-in. by 3-ft. wood block placed crosswise of the track. The push car is then spotted directly over the frog, whereupon one man, by standing on one end of the frog, can raise the opposite end so that the second man can pass a chain underneath it and hook it in position at that end of the car. After securely blocking the wheels of the car, the other end of the frog may be raised quickly with the aid of a bar or preferably a jack. The car is then pushed to the point where the frog is to be changed out, where it is dropped in the center of the track opposite the old frog by knocking the chains out of the hooks. This having been done, the car is pushed out of the way and the old frog removed and shifted far enough to one side to allow sufficient room for bolting and spiking the new frog, after which prying on a crowbar by one of the men will enable the other to insert the wood block below the old frog so that it may be hooked up to the push car

and hauled away in the same manner as the new frog was handled.

This method, aside from simplifying the work, saves considerable time. As an illustration, an instance was cited where it became necessary to change out a bad order frog during the night and the foreman and one man loaded a No. 9 frog 15 ft. long upon a push car, hauled it seven city blocks, made the change, brought the old frog back and placed it in a scrap pile, all in the space of one hour and thirty minutes. This method has also proved itself a safety measure, judging from the fact that 36 frogs were handled at Parsons, Kan., by this method without a single mishap or injury.

As may be expected, the usefulness of the hook is not confined to handling frogs alone, but it has also been used to advantage in handling 85-lb. rails. Here, as in the case of handling of frogs, the work can readily be done by two men.

The hooks were devised and have been regularly used by J. J. Guice, general yard foreman, Parsons, Kan.

How the Railways Maintain Their Bridges and Trestles

By G. W. REAR

Engineer of Bridges, Southern Pacific, Pacific System, San Francisco, Cal.

THE RAILROADS of the United States spend over sixty million dollars per year for the maintenance of bridges, trestles and culverts. These structures must carry the traffic over them and pass the flow of water beneath them, and unless both are adequately taken care of at the time of construction, maintenance is expensive, if not impossible.

The question of maintenance, therefore, should be given proper consideration when plans are made for construction or reconstruction. Structures should be designed to take care of the maximum flow of water that can be expected and the type should be one that will not only pass the water, but also the drift and debris, which are harder to handle than the water itself.

With the proper size of waterway determined, it is next in order to design structures that will have a minimum maintenance expense. It is usually necessary to keep the first cost as low as possible, but this should not be an excuse for putting in structures that will have abnormal maintenance or renewal costs. Examples of this shortsightedness are often found where culverts of short life are placed under high embankments, entailing very great expense for renewal in a few years. Sometimes in such cases culverts are made large enough to permit inserting smaller culverts through them later, but this is not as simple as it looks, for culverts have a habit of settling and twisting which makes the installation of the new culvert difficult.

Trestles are often driven where longer spans would be more suitable and spans themselves are often too short. In other words, errors in original construction make maintenance costs excessive.

For culverts, concrete and cast-iron are the most suitable materials from the standpoint of permanency, but conditions may make it advisable to use materials of shorter life, such as wood, sheet iron, etc. Some of the reasons for the latter are ease of handling to the work, less first cost, less time required to place, etc. Obviously, where renewal costs will be great, only the most permanent class of material should be used.

For longer spans, steel is most generally used for railroad structures although reinforced concrete is gaining a foothold quite generally.

Structures are no sooner built than deterioration begins. To maintain structures effectively and economically some systematic and regular method must be followed. The first requirement is proper inspection, which must be made frequently enough to give those responsible exact knowledge as to conditions.

On a well-organized railroad the inspections are about as follows: (1) Daily inspections are made by track forces to see that accidents or displacements have not taken place. This inspection is of a casual nature and is intended to discover only defects that might be noticeable to one not experienced in bridge maintenance. (2) Quarterly inspections are made by competent inspectors who are able to determine and report the exact physical condition of the structure. They may not be able to decide the carrying capacity of the bridge, but no defect in its parts escapes them. More frequent inspections are made, where necessary, such as during and after high-water periods, etc. (3) Annual inspections are made by those responsible for bridge maintenance to determine what repairs or renewals are necessary to keep the structures in first class condition. That the responsibility for good condition of bridges is felt by all concerned can be seen from an examination of bridges on a road that is otherwise poorly maintained; bridges will always be found in good condition even if other parts of the road are neglected. From this third inspection a schedule of repairs and renewals is prepared, which forms the program for the year's work, and the work is then carried out as consistently as possible.

It is almost universal practice to have a supervisor of bridges and buildings on each railroad division, and to him is delegated the responsibility of carrying out all the work authorized. To the supervisor falls the duty of organizing his forces and maintaining them through thick and thin. This latter is a problem, but not an insurmountable one. One thing that works against the supervisor is the lack of uniformity in the work throughout the year, but this is a problem of railroad work in general.

The supervisor must select and educate men for positions as foremen and must also educate his own successor. This is a duty he owes to the railroad. The selection of men for foremen is not as simple as it may appear at first glance. A foreman should be fair-minded, patient and a good judge of human nature so that he may secure the respect and confidence of the men. It should be realized that the foreman is the railroad's representative on the ground and in the minds of the men the railroad is judged by the actions of the foreman.

The successful foreman is the one who keeps harmony among the men and whose men work for him and not because of him. A good foreman does not have to stand over his men and drive them with threats, neither does he have to discharge a man occasionally to make the others fear him.

To conserve and make human energy effective, tools have been developed. Tools are of two general classes,

hand and mechanical, and both are labor-saving. Hand tools make labor effective and mechanical tools permit steam or other power to do work which otherwise would have to be done by hand. On a well-organized railroad there should be plenty of tools and the time used in keeping them in good order is time well spent.

We are now in a new era where men are better educated and where machinery is relied on to relieve the human body of part of its burden. The machinery most effective for bridge work includes pile-drivers, derricks, cranes, engines, power pumps, concrete mixers, air compressors, etc., in sizes to suit the particular need. The motor car is a good friend to the bridgeman, and a money-saver to the employer.

Concrete Cribbing Solves Difficult Roadway Problem

CONCRETE cribbing was used recently to form a retaining wall for a railroad embankment under circumstances that illustrate the particular advantages of this form of construction It was used to replace an old wall composed of wooden piles and timbers that had served to prevent a fill under a main track and a siding from encroaching on an old building abutting on

The Units Are Readily Handled by Two Men

the right of way. The old wall had rotted off and was pushed over against the building by the pressure of the fill so that the safety of the building was being seriously endangered and immediate action was necessary. A new wooden wall of the same type would only have repaired the damage temporarily, but would not provide permanently against its recurrence. Because of the proximity of a river, a monolithic concrete retaining wall would have required costly foundation work—excavating, driving sheet piling, and unwatering—and would have made it necessary to bring in materials, equipment and skilled men. The cost would have been considerably more than for concrete cribbing, as shown by the accompanying diagram. The limited space in which to build forms and pour concrete would have complicated construction methods. Speed was urgently needed in completing the improvement.

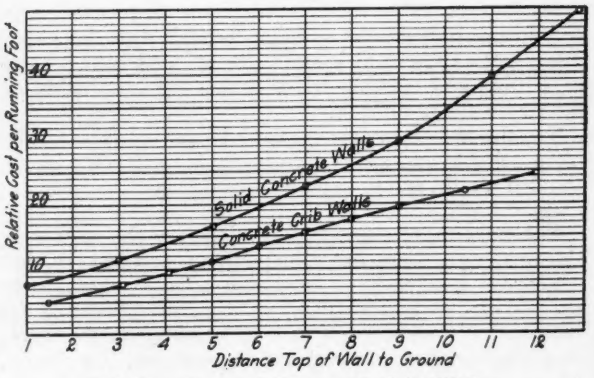
For these reasons, concrete cribbing was adopted for this installation. Its outstanding advantages were that it could be laid, one unit at a time, thereby disturbing only the minimum length of the old wooden wall at a time, while its stretchers and headers were of such weight that they could be easily handled by two men, thereby eliminating the necessity for bringing in any heavy handling equipment. Since a wall of this type requires no special footing, yellow clay at an elevation of about two feet above low water afforded adequate bearing. The possibility of undercutting was carefully considered, but from the nature of the surroundings this was deemed very remote.

The method of laying this wall is clearly indicated in

The Material Was Thrown Into the Adjacent Section

the illustrations. The economic dimensions of the stretchers were determined to be 6 in. by 6 in. by 6 ft. and the headers 6 in. by 5 in. by 6 ft. 6 in., with a 3-in. lug on two opposite sides at each end to hold the stretchers in place under load. The new wall was laid without any interruption to traffic by removing only enough of the old wooden wall at a time to allow for one pocket of the new cribbing. The material in the fill for this length was excavated and thrown over on the adjacent section while the cribbing was laid up and then back filled.

Since the wall is completely under water at flood



Relative Costs of Mass and Crib Walls

stage, it was necessary to protect against washing out of the fill between the stretchers by using considerable refuse, such as broken brick, stone and old timber in the fill. The ease with which this work was accomplished is indicated by the fact that the whole job was completed in seven days with a bridge gang consisting of 10 men, including cook and foreman.

The cribbing used on this retaining work is the Type "H" design, furnished by the Massey Concrete Products Corporation, Chicago.

Supervision Will Reduce Accidents

Continual Vigilance Will Overcome Carelessness. Foremen Can Do Much to Decrease Casualties

EVERY accident is one too many. Most accidents are avoidable. Carelessness leads to more injuries and deaths in construction and maintenance of way work than any other condition. The tendency to "take a chance" can be controlled only by continuous supervision on the part of foremen. The realization on their part of their responsibility for the protection of their men is in almost direct ratio to the interest shown by their local and system officers. The two articles which follow have been prepared by men who have made a close study of accidents among maintenance of way employees. These papers are particularly timely, as the season's work is now at its height and the gangs are filled with many men unfamiliar with railway service and its hazards.

Most Accidents Are Avoidable

By H. M. Mayo

Superintendent of Safety, Southern Pacific, Texas and Louisiana Lines, Houston, Texas

THAT safety as a general principle is recognized by the world of industry is strongly attested by the rapid decline in the casualty rate in all lines of effort in which man power is one of the prime factors. That the value of safety agitation and safe conditions and practices is realized and acknowledged by the railroads of this country, is borne out by the cumulative and constructive results which have rapidly followed the establishment of safety organizations and supervision by practically all of the more important transportation lines. As an illustration of this, the reports of the Interstate Commerce Commission show that while in 1910 there were 3,418 employees killed and 68,925 injured in train and train service accidents, there were only 2,107 killed and 46,920 injured from the same causes in 1920, in spite of the fact that the tons carried per mile increased nearly 38 per cent.

In maintenance circles the reduction has been also as apparent. Thus in 1917 there were 141 deaths and 25,685 injuries among track and bridge and building forces; in 1919, there were 126 deaths and 20,959 injuries; 1920 showed 138 deaths and 23,142 injuries, and 1921 a total of 116 deaths and 19,060 injuries. For some unexplained reason, 1919 was a most remarkable year in its history of railroad casualties and their decrease in all classes, but it was followed by a radical increase in 1920. There was, however, a marked decrease in 1921, due to the gradual betterment in conditions and a more intelligent supervision and support. The figures indicate an improvement, there being a decrease of 25 fatalities and 6,625 injuries in 1921 as compared with 1917.

A study of accidents and resulting injuries to railroad employees reveals the fact that by far the greater majority are unnecessary in that they are avoidable. Even as this applies to train and train service injuries, so too does it to injuries in the industrial occupations, in which each employee should recognize the hazard of his particular work and guard against it. This hazard is small compared to train and yard men, as statistics show, and the opportunity for maintaining immunity from fatal injury is much greater among the industrial employees, shopmen leading in this freedom from death, trackmen, second and bridge and building employees last. In 1921 one shopman lost his life for each 14,000,000 hours worked; one trackman lost his life for each 9,165,645 hours worked; one bridge and building employee was killed for each 2,803,380 hours worked. The great discrepancy between the maintenance employee fatal casualty rate and that of the shopmen, is because the mechanical employee is safeguarded from the result of careless operation by every possible device which can be thrown about his task—gear covers, pulley guards, locked switch boards, enclosed weights, close inspection of tools and appliances, eye guards and goggles, first aid stations, trained nurses, and work buildings provided with sanitary conveniences. In addition, the work is largely under cover and safety committees and supervision are always pertinent factors, while rules for the operation of machines and clothing are in effect and in the main enforced.

On the contrary, maintenance employees have few of these. Their work covers every mile of track and every possible weather condition. Gangs are widely segregated and work is under blue sky and on the right of way with train operation and the handling of heavy bridge material, rail and ties as an accompanying hazard. Tools are a simple, yet ever present factor, and the incentive to use these devices even when unsafe is greater than in the crafts, because of more difficulty in making them safe. Motor, hand and push car operation add to the situation, yet in spite of all of these, the task of both track and bridge and building employees is not properly a hazardous one and the number of fatal or serious injuries, as in the several other callings, is largely in proportion to the quality of care exercised by the workman individually, and the character of supervision on the part of the foreman, added to the cooperation and supervision of the other official units of the maintenance departments.

Safety is possibly more a matter of education than anything else. This will apply to track and bridge men with the same force of argument as it will to all others. This education carries more than one phase. It means that in addition to the maxim: "Self preservation is a first law of nature," men must be taught the risks of occupation and these risks are defined by the experience of others and by statistics exhibiting the rate of frequency and severity.

The intelligence of the worker is one factor; but often this intelligence is made negligible by a disposition to take a chance. It is true that man sometimes fails to profit by the adversities of his fellows, and until the individual himself has felt the weight of his own inadvertence or recklessness he fails to appreciate the necessity for a careful adjustment of his work in relation to his safety. It is a case of the "burned child dreading the fire."

A casual analysis of the situation would seem to suggest the adoption of certain rules governing the work details based upon the recognized hazards. These may be classed as "Don'ts" and they should set forth the things not to be done. They should be placed in the hands of all employees, and foremen should see that rules are understood and obeyed.

Unusual accidents should be circularized to serve as illustrations. Roadmasters and bridge and building supervisors should make frequent examination of gangs in order to know personally that the rules are understood. Education should be continuous and consistent.

All tools should be examined at frequent intervals and unsafe ones sent to the shop. Standards of safety as to tools ought to prevail. With trackmen, the most prolific sources of injury are found in handling material, rails, and ties, gravel or rock flying under picks, spikes flying under improper blows from a maul, glancing blows from tools, falls of persons, falls of objects, strains from lifting, and injuries received in handling rail on and off cars, and from the operation of hand, motor and push cars. In the bridge and building service possibly the causes which lead to the greater number of injuries are represented by falls of persons and objects and handling material.

It would seem at first glance that few of these could be governed by restrictive measures on the part of foremen, yet I am strongly inclined to believe that the results as evidenced by the performance of certain gangs are often in proportion to the quality of supervision, that is, the personal interest on the part of foremen in so directing the employees as to minimize the opportunity for injury by careful education of the men in proper and safe methods or practices. I have here in mind two instances of loading rail taken from track. One gang on these lines picked up several miles of rail without injury to employees, while another gang, handling a lesser quantity, suffered severe injury to six or eight of its members. Conditions were similar as were the forces, but the difference was probably due to the character of supervision. On one of our Louisiana lines a section foreman has operated a gang for over 30 years without a serious injury to any of his men in that period.

On the western railroads in 1921, 24.1 per cent of the trackmen and 36.1 per cent of the bridge and building men were injured per million man hours; while on the eastern lines only 21.7 per cent of the trackmen and 20 per cent of the bridge and building employees per million man hours—quite a variation, considering in this also the density of traffic and the greater number of main tracks in the east, the western lines being largely one track roads.

The probable answer to this is in the type of men employed. In the east, maintenance employees are white. On many of the western roads, the men are nearly all Mexican, of limited intelligence, and speaking but little English; wandering in their habits, and only occasionally remaining long enough on one road to become familiar with methods of operation and safety.

The education of the track laborer has been neglected in the main on most of the roads. On some, this discrepancy is being remedied; it is on these lines, but so long as the Mexican is the main track work unit and he persists in "flitting," just so long will our educational suggestions and teachings be largely negligible.

With bridge and building employees, the ratio of intelligence is good as to the skilled men, but the segregation of the gangs makes it more or less difficult to create the same degree of caution and observance of safe practices as that which is now so manifest among train service employees and which is steadily decreasing the percentage of serious injuries.

Concluding, I would suggest that safety as a principle should be part of the mental equipment of all maintenance supervisors. It would follow then that safety as a practice would be developed among the men. With the engineer of maintenance thoroughly sold on "Safety," his subordinate heads, including roadmasters, section, bridge and building and water foremen and signal supervisors, will "follow the lead" to the end that the doctrine of self-preservation will be reinforced by constructive education of the men in proper practices. To this must be added safe and adequate tools, protected motor cars, more commodious hand cars, where used, rail forks, tie tongs, good jacks, uniform methods of handling material, and rules for proper protection against trains and in the correct operation of motor, hand and push cars. To all of these should be added a liberal portion of human interest, sanitary and comfortable quarters, and a generous cooperation on the part of all units of service, for often, as it was remarked long ago in Gilbert and Sullivan's creation, "The Pirates of Penzance," a policeman's life is not a happy one."

The Foreman Is the Schoolmaster

By T. P. Brennan
Supervisor of Safety, Long Island Railroad

THE Belief that as much attention is not given to the safety of maintenance of way employees as to employees in other departments of the railroads is hardly borne out by the facts. The character of the work, the frequent labor turnover and the multi-nationality features must always be factors in a clear determination of what is being done to safeguard maintenance of way employees.

The observation has been advanced that "safety work has not been carried to the same extent in this department as is advisable." One of the disheartening problems in this respect is the difficulty involved in the handling of men whose knowledge of the English language is, often, extremely limited; in fact, in many cases a section foreman with a fair degree of skill in his work but a meager knowledge of English may have a gang of four laborers, all of a different nationality, and each knowing very little English, or even the foreman's tongue, and little of the hazards incident to their work. To "sell" safety to such men is vital and justifies exceptional effort, but it implies the almost inescapable fact that the casualities in such cases will necessarily be frequent.

In the South where the track laborers are chiefly colored men and in some sections Mexicans, under Mexican foremen, the language factor is not so much of a problem. Where possible it should be the rule to have a foreman or subforeman and gang who all speak the same tongue.

In bridge and building work, exceptional care is necessary in selecting workmen, and, as a rule, such care is exercised. The men are journeymen, familiar with their respective parts of the work and fairly well acquainted with the hazards of the job, but not always as fully keyed up to the safety spirit as they should be. Here enters that factor for real safety, the foreman. He is truly the keyman. If he is derelict in a proper appreciation of the duty he owes to the safety of his gang, he is not the ideal foreman, regardless of his ability to hustle along a hurry-up job. Many a "crackerjack" hustler has spoiled his good repute as a foreman by subordinating safety to speed. The speed is often lost, or badly discounted, by lost time accidents, or even fatalities, when safety has not been the first consideration.

The casualties due to the handling of heavy materials are an indictment of the slipshod methods so frequently employed. Lectures embodying the rules contained in the Material Handling Cyclopedia should be held from time to time and, where necessary, conveyed more fully through interpreters to men not familiar with the English language. Where these lectures can be illustrated by lantern slides or films, as well as the text translated by the interpreter, the results will more than compensate for the time and expense.

It is entirely possible that less attention was paid to the measures necessary to the protection of maintenance of way employees before the creation of the Safety sec-

tion of the American Railway Association, but the excellent work done by the National Safety Council, Steam section, has been of inestimable value. It is a fact that more intensive safety work has followed the initiation of the American Railway Association's Safety section, not alone in the maintenance of way department, but in all departments of railroad operation.

General W. W. Atterbury has said: "Organized safety is primarily a cooperative movement between the management and its employees to secure the safety not only of its employees, but, through a more highly developed efficiency, to prevent accidents involving its patrons, and the public generally. The principles of safety first should be fundamental in all railroad operations, and paramount to all other considerations, whether of expense, convenience or commercial efficiency." No more inspiring contribution has reached the safety men of the American railroads than this endorsement. It gives renewed vitality to drooping spirits.

The extent to which goggles are used in cutting and other work by maintenance of way employees has a marked bearing on accident prevention. Of course, the old problem of getting the men to use goggles when necessary and to educate them as to when and under what conditions that necessity arises, must enter. First, in this particular, is the importance of a proper goggle, one that fits and is reasonably comfortable, otherwise the men will resort to varied excuses and pretexts for not wearing them, and eye accidents, as a consequence, increase.

Let the foreman take enough time and interest to see that the men individually are provided with suitable goggles, in metal cases, and carried by the men at all times when at work, and used in work involving eye hazards. As far as possible do not allow one man to wear another man's goggles lest infection follow.

The frequent labor turnover in the maintenance of way department necessitates frequent exchange of goggles. In no case should goggles worn by one man be used by another until they have been properly sterilized. The company's chief surgeon will recommend any one of several good solutions. In the absence of such solution thoroughly boiling the goggles will sterilize them.

Carelessness in carrying tools on hand cars, motor cars and track velocipedes has resulted in death or serious injury to many employees in maintenance of way department. The carrying of long tools on track velocipedes should be forbidden, arbitrarily. Safeguarding the hand car, and especially the more speedy track motor car, by means of substantial screens, to prevent material from being thrown off and derailing the car, is a step in the right direction and is recommended as good practice by most roads.

A particularly unsafe practice is short flagging by section gangs who leave hand cars insufficiently protected by flag, with the constant hazard, in all such instances, of not only endangering the lives of the trackmen, but also of derailing the train which strikes the hand car. The rule is clear in this respect; its enforcement should be more rigorous.

"Struck by passing train" is a casualty notation appearing all too frequently in accident reports involving trackmen. Here is where the foreman's work of educating inexperienced men is vital. The use of the signal whistle by the foreman, particularly in warning large gangs, is a forward step in safeguarding maintenance of way track laborers. Some of the roads with the lowest casualty average are those which have placed these whistles in the hands of the gang foreman. When it is understood by the gang foreman that his men are largely inexperienced, and ignorant of the hazards of their work, a capable foreman will find a large part of his important duties will be made up of educating his men in avoiding unnecessary risks.

Attention is invited to page 36, items 26 and 39, of Interstate Commerce Commission Accident Bulletin No. 82 for 1921, showing fatal as well as nonfatal accidents to "sectionmen" and to "other men in construction gangs and work trains (unskilled employees only)." These analyses should be scrutinized carefully by maintenance of way officers and especially by track supervisors and section foremen. Page 72, item 9, of the same bulletin tells a story in casualties in the handling of rails, ties, bridge timber, etc., that might well make us pause and consider better methods of handling heavy material.

"Third Rail" has an ominous sound to most maintenance of way men. With the trend in the direction of more general electrification of the railroads of the country—and the trend increases yearly—the education of men unfamiliar with high tension hazards needs keen stressing; the most carefully trained electrician, no less than the green track laborer, should be constantly on the alert, after full and clear instructions, before being permitted to work in third rail territory.

Roads operating electrified lines should, in all cases, maintain resuscitation classes wherein each high tension lineman and each third rail man is given full instruction, monthly, both as operator and as subject, in the prone pressure method of resuscitation. Some of the more advanced advocates recommend the "counter shock" theory of striking the unconscious victim a sharp blow on the jaw and calling his name loudly directly into his ear. This is said to have restored consciousness when all other efforts have failed. The adoption of the countershock idea should, however, be subject to careful investigation.

Defective tools has been the source of many serious accidents to trackmen and other maintenance of way employees, and here again enters the foreman who is "onto" his job. He should see that mushroomed tools, split or crossgrained maul handles, worn wrenches and other defective tools are discarded and a sufficient supply of "extras" kept to use while the worn or broken tools are in the shop for repairs.

Generally, the maintenance of way department needs our sympathy and encouragement, and probably no more insistent thought can sum up the requirements of this department than the dominant duty to "educate," and go right on educating, the men, the new and the experienced, in means of avoiding unsafe conditions and of discarding unsafe practices. When these things are more generally observed the standard in accident prevention shall have been placed far above what it was a few years ago, and even above the best we can boast of today; and the foreman is the schoolmaster.

Lest We Forget, the Old Chicago Union Station

Rebuilds Train Shed in Record Time

Pennsylvania Makes Remarkable Progress in Restoring Broad Street Terminal for Service After Fire

THE RECONSTRUCTION of the train shed of the Broad Street station of the Pennsylvania System at Philadelphia, Pa., which was destroyed by fire on June 11, illustrates most effectively what can be secured through proper organization and leadership in an emergency. Detroyed almost completely early in the morning of June 11, it was back in service with electric and steam operation over all 16 tracks by the afternoon of June 19, and the emergency forces were disbanded by the following day. A short description of the fire appeared on page 286 of the July issue of *Railway Engineering and Maintenance.*

Working Forces Quickly Organized

The fire had only been under way a short time when the executive, operating and other offices were notified and plans laid for meeting the serious emergency. The authority and responsibility for the restoration of the station facilities were placed in the hands of H. H. Garrigues, superintendent of the Philadelphia Terminal division. In order to secure ample and adequate directing and supervisory forces, the division engineers, master carpenters, supervisors of tracks, trainmasters and a large number of track, bridge and building foremen and general foremen were called in immediately from the adjoining six divisions. In addition, the local officers, including master mechanics, supervisors of telegraphs and signals, the station master and his assistant, chief and assistant electricians, road foremen of engines, etc., were included and worked together in day and night forces.

Skilled carpenters, mechanics and laborers were likewise recruited from these divisions, the main bulk of the labor, however, being furnished chiefly by five contractors, who shut down such outside work as they were doing and concentrated their men at Broad street. The nucleous of this organization was formed and in operation before daybreak of June 11, and by daylight a large number of workmen had been assembled at Broad street and some work started, although the structure was still burning. Continuous operation was necessary and the work was, consequently, divided into day and night forces. These forces were again subdivided into groups, headed by division engineers and master carpenters in the rebuilding of the structure, and by trainmasters, master mechanics, etc., for the other work, such as operation, removing abandoned equipment, etc. These groups consisted of units assigned to the clearing away of debris, the rebuilding of the structures supporting the tracks, the building of tracks and platforms and the reconstruction of the substructure. The forces varied in number from 800 on the day shift and 605 on the night shift, on June 11, to 2,317 on the day and 1,224 on the night shift on June 15.

With the active co-operation of the purchasing department, necessary supplies were ordered immediately. Lumber formed the largest item of material and it is an interesting fact to note that orders for over two million board feet were prepared and ready for transmission to the dealers before the lumber yard offices were opened on the morning of the fire. The same was practically true of the other needed materials, the larger items of which were 100,000 lb. of nails and spikes, 150,000 ft. of electric wiring, 350,000 ft. of telephone and telegraph wire and 250 tons of rail.

View in Trainshed on June 20.

Practically all of this material was delivered on the first few days by truck to either West Philadelphia, where much of it was transferred to cars, and to Broad street direct. Lack of storage space at the latter place prevented any large amount being stored at that point. As the work progressed, much additional material was brought in from surrounding towns and cities by car to the West Philadelphia yards, where it was held and forwarded as needed.

While the fire was still burning, a platform was built beyond the western end of the trainshed, a wooden stairway constructed to Filbert street, a cinder footwalk built for tracks 14 to 16, and the catenaries over tracks 11 to 15, outside the trainshed, put into service. This was in preparation for the resumption of the electrified commuter service and by the evening of the first day about 38 trains had been operated out of Broad street, and by Tuesday the full service had been resumed.

As the fire burned out or was brought under control, the maintenance forces moved under the trainshed, clearing away and loading debris, laying new ties and rails, etc., on the first third of the track structure, this part being a filled-in section. Work was also started on the construction of two platforms of two-inch timber, beginning at the temporary platforms for the electrified service outside the trainshed and working in toward the concourse. Where it was possible, stripping of the remaining debris attached to the roof structure was also carried out.

The old floor system under the major portion of the shed was of deck plate girder construction, which in recent years had been strengthened to carry the additional loading resulting from modern equipment. The cross ties for the track rested directly upon the girders and, in turn, supported two longitudinal lines of timber upon which the rails were laid. The platforms were also of timber, while all spaces between the platforms and the rails were covered with planking overlaid with a heavy coating of asphalt water-proofing. The space underneath was utilized for baggage and mail rooms, power plant, etc., with a ceiling consisting of corrugated sheet iron suspended from the girders. The floor system was largely destroyed by the fire and the girders in many places were badly warped and twisted.

In rebuilding this section, the debris was dropped through to the street level, where it was picked up and hauled away by trucks. In the meantime, the carpenters began shoring up the steel construction. Timbers, 12-in. by 12-in. and 14-in. by 14-in. in size, were set up in two-column bents approximately 10 ft. apart under the girders. Where the steel was only slightly warped, it was shored up in the same manner. In some sections the girders were cut out entirely and timber trestles substituted. The ties were placed directly upon the steel, after which the rail was laid in the usual manner.

On Tuesday, the day following the fire, the platforms started on the previous day between tracks 15 and 16 and between 13 and 14 were completed to the concourse by the night forces, thus permitting the commuters to use the waiting rooms and other headhouse facilities. This work was followed by the completion of the tracks served by these platforms, after which unit after unit of platforms and tracks were rebuilt and placed in service. The platforms were constructed to the elevation of the top of rail and the spaces between the platforms and the rails and between the rails were filled in with timber laid longitudinally, all to top of rail. The planking between the rails was next covered with asbestos and this, in turn, protected by metal sheeting. Since the old roof structure could no longer be used, it was decided to use umbrella sheds over the platforms and this work followed in turn. By June 19, all of the old equipment had been removed, the platforms and tracks completed, the catenary construction for the electrified service extended into the "trainshed" and all tracks put in service.

The fire involved the partial destruction of about 500 wire circuits, the majority of which were for telephone connections, besides about 35,000 ft. of twisted pairs

Nine Days After the Fire

used for other service. Within 72 hours after the fire started, the telegraph and signal department had 400 pairs of wires ready for use, many of them being suspended from the housetops and buildings on the adjoining street.

As soon as service was restored at Broad street, the design and erection of a traveler to dismantle the old steel arches was started. This traveler will utilize six tracks, four tracks being used for its support and two tracks for work trains. It is made up of two protection sheds, each spanning five tracks and carried, respectively, on tracks 1 and 7, and 10 and 16, tied together and supporting a trestle construction for the support of the arch rings. The dismantling traveler

Conditions at Track Level After Fire with Platforms and Tracks Destroyed and Supporting Structure Badly Distorted by the Heat

spans the center two tracks and will be equipped with two 105-ft. booms. The protection sheds are enclosed with two-inch planking on the sides and top for the safeguarding of the passengers using the platforms beneath.

Train Movements Increased

Train movements in and out of Broad Street station were at their lowest on Monday, the day of the fire, when only 38 were operated in both directions. On Tuesday there were 142 trains in and out; Wednesday 151, and by Thursday the total was 245. This was increased to 275 on Friday and Saturday. Just one week, to the day, after the fire, out of a total of 530 trains normally operated in and out of Broad Street station, over 301 were using the terminal and by June 25, 371 trains, or over 70 per cent of the total, were being operated in and out of the station. It is interesting to note that in spite of the loss of its terminal facilities, the Pennsylvania was able to operate its trains on Monday, the first day of the fire, with a curtailment of less than 5 per cent, and this applied to local trains only. No through traffic or sleeper service was annulled, such traffic being diverted or otherwise handled at West Philadelphia, and at North Philadelphia, along with the local train service which was handled at these two points and at two other less important places.

We are indebted to H. H. Garrigues, supeintendent of the Philadelphia Terminal division, and to Walton M. Wentz, editor, Pennsylvania News, Eastern region, for the information contained in this article.

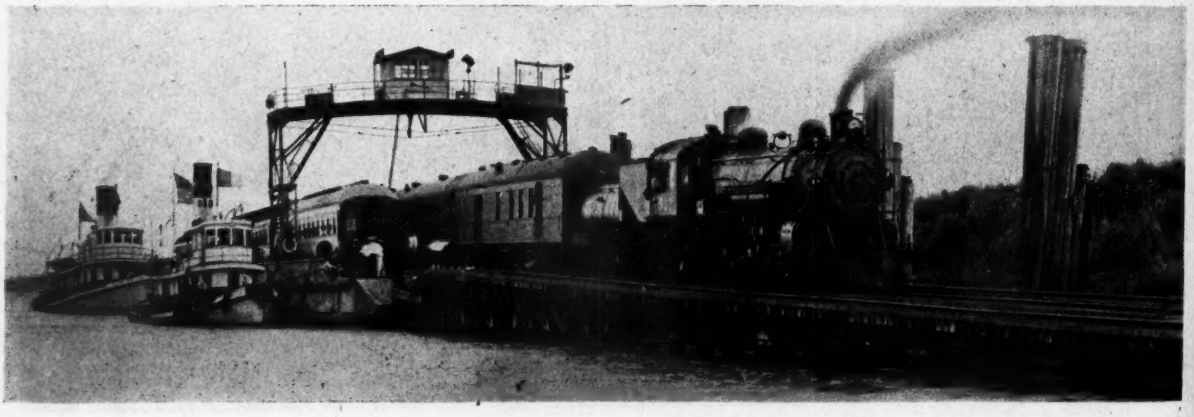
An Unusual Problem of Engineering Design

THE illustration shows a form of construction encountered only at rare intervals in railway service, being the incline approach to the car ferry of the Southern Pacific at Avondale, La., 11 miles northwest of New Orleans. All passenger trains entering or leaving New Orleans on this road cross the Mississippi river on this ferry, which is 360 ft. long and 50 ft. wide. Three tracks are carried on its deck and trains are cut into as many sections and with their road engine and a switch engine are ferried across the river, which at this point is over half a mile wide.

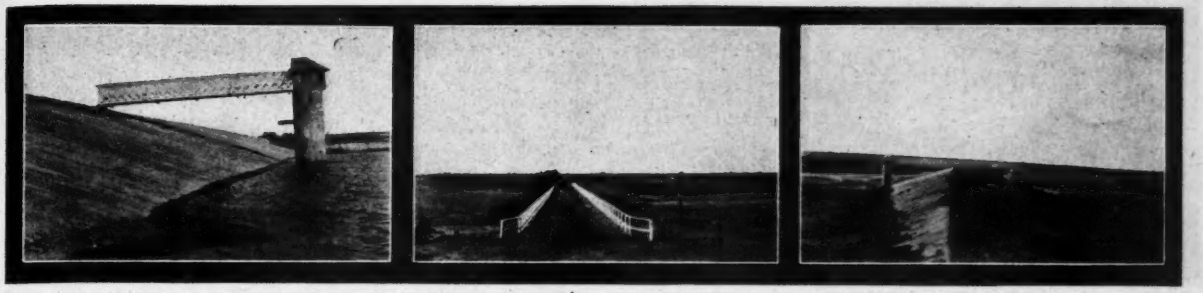
The cradle on which the engine is standing is supported on ordinary freight car wheels and is moved up and down the incline, most of which is under water in the picture, on ordinary rails laid on the incline. This incline is of a sufficient length to provide for a variation of over 25 ft. in the level of the river. An idea of this variation is gained from the statement that during flood periods the water stands above the tops of the short piles shown in the pile clusters.

When it is necessary to move the cradle up the incline this is done by butting it with the barge and when necessary to move it down the incline this is done by running the switch engine on it at a considerable speed and applying the brakes suddenly. The tail of the cradle, under which there are no wheels, slides along the rail on the incline and the friction is just enough to serve as a drag or anchor so that the cradle will not move unless some force is applied to it.

We are indebted for this information to H. M. Lull, chief engineer, Southern Pacific Lines, Houston, Texas.



A Southern Pacific Train on the Ferry at the Incline



Views of the Storage Reservoir Showing (1) the Intake Tower and Concrete Paving of the North Dam. (2) The Public Road Forming the South Dam. (3) An End View of the North Dam.

Missouri Pacific Builds Large Water Supply and Softening Plant

Novel Solution of Variable Flow Problem Presented in Plant Now in Operation at Hoisington, Kansas

THE Missouri Pacific recently completed the construction of a 200,000,000 gal. storage reservoir with pumping station and water treating plant to serve its terminal and shops at Hoisington, Kansas, necessitated by the increased demand for water at this point and the impossibility of securing a suitable supply from wells in the immediate vicinity.

After full investigation, the only feasible plan presenting itself with which to insure an adequate water supply was to install a small dam in Walnut creek 6½ miles south of Hoisington, capable of impounding approximately one month's supply, and to pump from there over a divide into a storage reservoir located in a ravine which is followed by the Great Bend branch between Hoisington and Dent's Spur, the latter about 4 miles from Hoisington. From this reservoir water is conducted by gravity to a water treating plant located east of the roundhouse at Hoisington, and from the treating plant the water is transferred to elevated tanks and various points required. The storage reservoir necessitated the relocation and construction of 1.3 miles of the Great Bend branch line.

The reservoir has a surface elevation of 36 ft. above the top of the water treating tanks, an area of 48 acres, a maximum depth of 25 ft., and will impound 202,000,000 gal. after deducting losses. This will provide approximately a 15 months' supply for the terminal.

A pump pool was formed in Walnut creek by constructing a concrete gravity type dam 6 ft. high and 50 ft. long with a 30 ft. spillway provided with a sluice gate 48 in. in diameter for washing sediment from the pool. A water tight box or cofferdam of Wakefield sheet piling 16 ft. long was driven and left in place and a concrete footing 15 ft. wide, 50 ft. long and 3 ft. deep was poured to support the dam and also to act as an apron at the lower side of the spillway to prevent scour. The pump pool impounds 11,000,000 gal. of water, the dam backing up the water for a distance of two miles.

Four Centrifugal Pumps Operate in Various Combinations

The pumping equipment consists of Fairbanks-Morse & Company single stage, horizontal, split case, double suction, belt driven centrifugal pumps, with oil engines. This equipment is housed in a 32-ft. by 54-ft. frame house on a concrete foundation with a 30-ft. by 20-ft. concrete pump pit 19 ft. deep. The pumping, normally, will be to the storage reservoir, which is two miles north of Walnut creek, but for use during construction and emergencies a by-pass line was laid through the reservoir to provide for direct pumping to the treating plant at Hoisington, 6½ miles distant. Since Walnut creek is a stream of variable flow, four pumping units were installed at that point, consisting of one 15 hp. engine and 4-in. pump, two 25 hp. engines and 5-in. pumps and one 50 hp. engine and 6-in. pump with independent suction lines for each pump, three of which are 8 in. in diameter and one 10-in. in diameter and 100 ft. long. The discharge line, for pumping to the reservoir, consists of 7,700 ft. of 12-in. pipe producing a static lift of 50 ft. This line discharges into a concrete sump from which the water flows by gravity through 3,000 ft. of 15-in. d.s. vitrified pipe. When pumping direct to the tanks at Hoisington the discharge will be through 7,700 ft. of 12-in. c.i. pipe, 4,520 ft. of 8-in. pipe, 21,830 ft. of 14-in. c.i. pipe and 100 ft. of 12-in. c.i. pipe.

In order to meet the variations in flow of the stream the pumping units were arranged so that they may be connected to work in parallel or series up to a maximum load of 100 h.p. They will develop the following deliveries under various combinations:

When pumping to the reservoir—

15 hp. unit alone, 500 gal. per min.
25 hp. unit alone, 750 gal. per min.
15 hp. and 25 hp. unites in parallel, 1,000 gal per min.
2—25 hp. units in parallel, 1,200 gal. per min.
50 hp. unit alone, 1,400 gal. per min.
2—25 hp. units in series and in parallel with 50 hp. unit, 1,700 to 1,800 gal. per min.

When pumping to the treating tanks—

15 hp. unit alone, 500 gal. per min.
25 hp. unit alone, 650 gal. per min.
2 25 hp. units in parallel, 800 gal. per min.
50 hp. unit alone, 1,000 gal. per min.

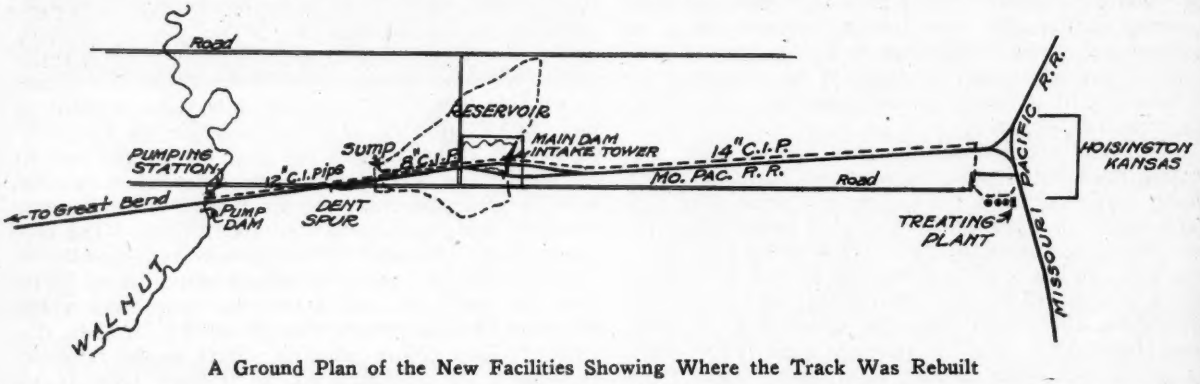
The facilities also include two steel casings 24 in. in diameter fitted with strainers of the same diameter sunk on the bank of the creek to a depth of 25 ft. below the suction lines, tapping the underflow. The wells were provided to afford a protection from any unusual drouth. These wells were connected with drop lines to two of the pumps and yielded 400 gal. per min. each on test. Duplicate, direct connected 1½ hp. gas engines and air compressor units were installed, also electrical equipment for starting the oil engines. The pump house and the

The Pump House (1) Is Electric Lighted, the Dam in Walnut Creek (2) Has a Sluice Gate for Removing the Mud, and the Treating Plant (3) Is an Intermittent Type With Air Agitation.

pumper's dwelling, which was erected at the pump site, are both electric lighted.

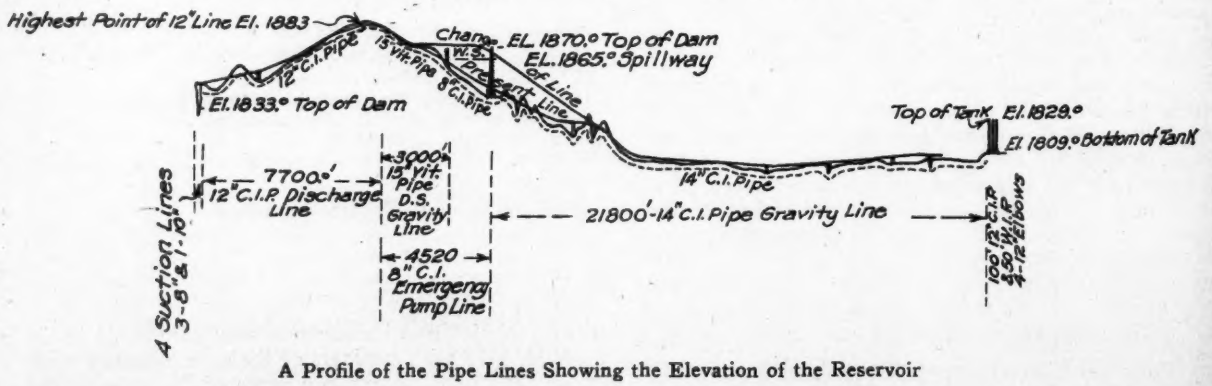
Concrete Paved Earth Dams Form Reservoir

The storage reservoir is located in a natural draw which includes an old steam shovel pit where material was borrowed to grade the yard and shop grounds at Hoisington in 1913. An earth embankment was constructed to form a dam at the lower end of the draw, which is 1,700 ft. long with a maximum height of 30 ft. as the north dam of the reservoir. The reservoir embankments were constructed of clay excavated from within the reservoir area, and deposited in layers one foot thick. The top soil from the foundations and borrow pits was stripped off and wasted. A muck ditch was excavated along the center line of the main dam to a depth of six feet to solid sandstone and back filled with selected moist clay firmly compacted to prevent seepage, thus forming a core wall for the dam. As there was considerable rain at regular intervals during the period



A Ground Plan of the New Facilities Showing Where the Track Was Rebuilt

The crown width is 10 ft. with 3 to 1 slopes. It was necessary when building the reservoir to raise a public road which crossed the upper end of the reservoir for a distance of 800 ft. This road has a maximum height above the old grade of 15 ft. and 20 ft. at the outer slopes and a crown 30-ft. wide with 1½ to 1 slopes. of construction, it was not necessary to sprinkle the material and the travel of the teams and wagons engaged in the construction work thoroughly compacted it. After the embankments were completed they were trimmed to a uniform slope and the water slopes protected with a 5-in. slab of concrete reinforced with tri-


Highest Point of 12" Line El. 1883
Change W.S. Present Grade Line
EL. 1870.° Top of Dam
EL. 1865.° Spillway
12" C.I. Pipe
15" Vit. Pipe
8" C.I. Pipe
El. 1833.° Top of Dam
Top of Tank El. 1828.°
El. 1809.° Bottom of Tank
14" C.I. Pipe
7700.'
12" C.I.P. Discharge Line
3000.'
15" Vit. Pipe D.S. Gravity Line
21800'-14" C.I. Pipe Gravity Line
4520
8" C.I. Emergency Pump Line
4 Suction Lines 3-8" & 1-10"
100' R. C.I.P. 4-90° 14" C.I.P. 4-12½° Elbows

A Profile of the Pipe Lines Showing the Elevation of the Reservoir

Guard railings were constructed on each side of the roadway. A settlement was made for permanent damage for any drainage which may stand at times above the public road and the embankment was made water tight inasmuch as any water stored beyond the road would stand at such a shallow depth as to be lost in evaporation and seepage. The roadway was thus made to serve also angular mesh and provided with expansion joints 25 ft. apart. The outside slopes were provided with protection from washing with a top dressing of soil one foot thick, sown with grass.

A reinforced concrete intake tower 8 ft. in dia. inside and 32 ft. high, connected with 4-ft. by 6-ft. culvert through the dam, was constructed and equipped with a 14-

in. dia. riser pipe inside and arrangements of valves and connections to the outside of the tower so that water may be drawn from the bottom of the reservoir or depths of from 10 and 20 ft. above the bottom. The operation of the valves is controlled from valve stands located in a house on top of the tower, access to which is obtained by a 76-ft. footbridge. A connection is made between the 8-in. emergency pump line and the 14-in. line in this tower, and the 14-in. gravity line from the reservoir is carried through the culvert, which is made easily accessible for repairs. A blow-off valve is also provided in the 14-in. line just outside of the dam, which may also be used as a reservoir drain. Four openings one foot wide each and three feet high, giving a total area of 12 sq. ft., are provided in the tower, the lower part of these openings occurring five feet below the top of the tower, or on a level with the top of the dams. These openings provide sufficient overflow area, there being very little drainage into the reservoir and the water level affording control by pumping. The culvert was constructed with collars spaced 20 ft. apart along its length with clay carefully puddled around it to prevent seepage through the dam.

All trenches for the pipe lines were excavated to line and grade with a trenching machine, the average depth being four feet. The cast iron pipe was laid with Metalium in the joints, which required no caulking. The vitrified flow line was laid with yarned joints reinforced by concrete collars around the bells. No leaks have been encountered in these lines except at a few joints where split pipes were found and removed.

The Treating Plant Is an Intermittent Type

The water treating plant consists of a three-tank intermittent system with steel tanks 30 ft. in dia., and 20 ft. high, set on crushed rock foundations. Radial concrete paving is provided around the tanks and operating valves are placed in an 8-ft. by 10-ft. frostproof box at each tank. The chemical house is a 14-ft. by 56 ft. frame building on a concrete foundation, having a 14-ft by 36-ft. chemical storage room and a 14-ft by 20-ft. operating room. The chemical machinery consists of a steel vat 5 ft. in diameter and 4 ft. high, located in the storage room, and fitted with water, steam and air connections for dissolving and mixing the chemicals. A portable platform scale is also included. In the operating room is located a 1½ in. open impellar chemical pump direct connected to a 3 hp. motor which delivers the chemicals through 1½ in chemical lines to the treating tanks. Air lines are connected to each tank with perforated branches in the bottom for agitation.

There are two treated water pumps, each consisting of a 4-in. horizontal split case double suction centrifugal pump direct connected to 25 hp. motors, arranged in duplicate. Each is capable of delivering 600 gal. per min. and both are located in the operating room of chemical house, where they receive the treated supply from the tanks through an 8-in. w.i. line and discharge it through an 8-in. c.i. line to a covered concrete sump supplying the fire pumps located in the power house, and to two elevated tanks having roadside outlets. The chemical house is steam heated and electric lighted. All pipe and concrete materials were distributed by train from the old location.

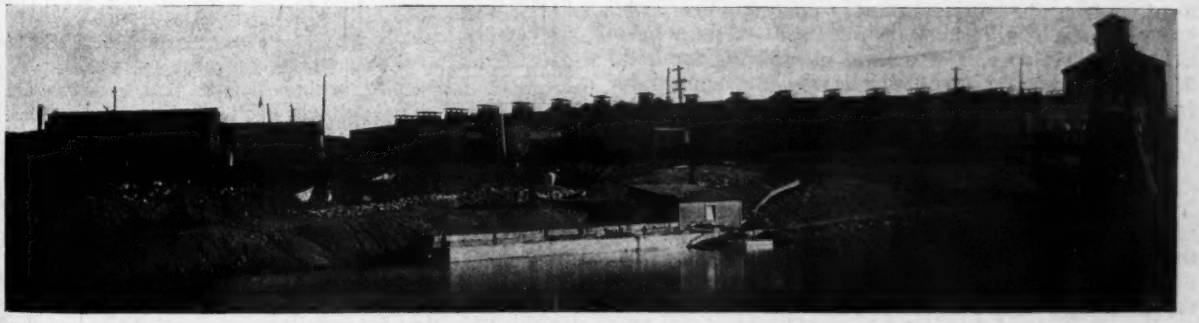
As stated previously, it was necessary to relocate a portion of the Great Bend branch line which ran through the center of the reservoir site. However, before this was done all pipe and concrete materials were distributed by train from the old location. Once the grade for the line, as relocated, was completed, the track was shifted in a day, using half new ties which were distributed over the new grade in advance. Two 10-ton caterpillar tractors were employed for the purpose. One to snake the rails down the old line and the other to haul them up the new grade. Forty 30-ft. 56-lb. rails joined together with the angle bars were handled in this manner at one time. The serviceable ties recovered from the old track were hauled over and put in after the line was placed in service and a light locomotive was used on the mixed train which operates over this line, until the track was full tied and ballasted.

All the pipe lines and structures were placed either on the right of way or adjacent to it, where material could be unloaded or distributed from the track without further handling.

The Plant Is Equipped With Recording Meters

The plant is equipped with the means of keeping a complete record of all water handled, a Venturi meter having been installed at the pump house for registering the total pumpage, while a graphic water stage recorder is located at the reservoir for recording the continuous daily record of the reservoir stage and tank measurements at the treating plant, showing the amount of water actually treated and delivered to the terminal.

With the exception of the cement, prepared roofing, standard paint and machinery, which was furnished by the railroad, all of the material and labor used in connection with this work was furnished by contract at unit prices. The work was carried out by List & Gifford Construction Company, Kansas City, Mo., except the three steel treating tanks which were furnished and erected by the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa. The work was carried on under the direction of E. A. Hadley, chief engineer, Missouri Pacific, St. Louis, Mo., to whom we are indebted for the above information.

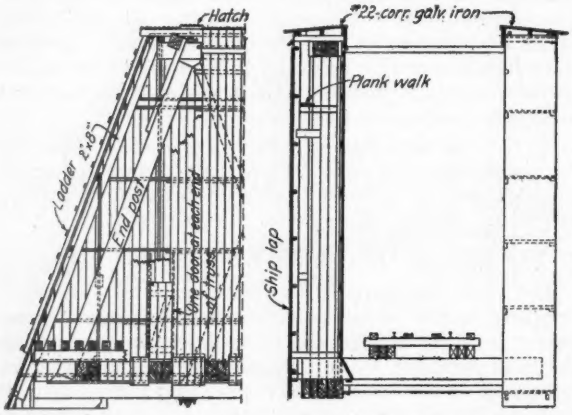


St. Louis-San Francisco Engine Terminal at Springfield, Mo.

Covering Howe Trusses Increases their Life

THE HOWE truss, once the most common form of construction for highway and railway bridges in the older portions of North America, has long ceased to be a factor in structural engineering in the east or middle west. However, on the Pacific coast, with its wealth of Douglas fir and other structural timbers, the wooden truss bridge has played a very important part in railroad development and still continues as one of the most practical forms of construction for bridging important streams.

In applying this form of construction to western requirements, the builders eliminated one detail that was once a standard feature of the old Howe truss of the east. The wooden housing, used alike on the old highway and railway bridges and still familiar to the memory of all save the youngest generation, was considered an unnecessary refinement of questioned utility. As one west-



The Trusses of Through Spans are Housed Separately.

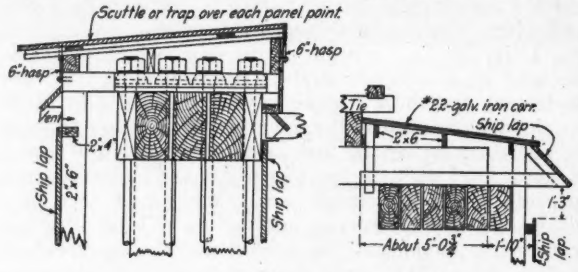
ern engineer expressed it, "We thought we were smarter than the old bridge builders of the east and could see no valid reason for going to the extra expense of these covers." From the standpoint of economy this was perhaps correct in the earlier days of western railroad construction. Lumber was exceedingly cheap so there was little incentive for applying any measures that might perhaps increase the life of the structure where the saving to be accomplished was not thoroughly established.

However, with increased cost of lumber and the expense of framing and erecting wooden bridges, the total expense of renewing a Howe truss bridge has greatly increased so that the fact that these spans have been giving a low service life, became a matter of real concern and railway engineers began to revise their attitude toward covering the trusses. Studies along this line made by the Chicago, Milwaukee & St. Paul's western lines led to the development of a form of covering for both deck and through bridges which was first applied in 1910 and the results secured have clearly demonstrated the advantage of such a protection.

Trusses Are Covered Separately

As shown in the drawings, the form of covering adopted differs from the older eastern practice in that the trusses are covered individually instead of providing a complete covering for the entire span. The side walls are covered with one-inch shiplap placed vertically on a frame composed of 2-in. by 6-in. studding and 2-in. by 4-in. girts. The roof is composed of No. 22 corrugated galvanized iron laid on one inch boards and pitched toward the outside on a slope of 1½ in. in 12 in.

On through bridges the trusses are enclosed on both sides with the outside walls boxed out from the diagonal posts a sufficient distance to afford ample space for a passageway to facilitate inspection of the trusses. A 2-inch plank walk is provided in this clear space at the level of the bridge deck and another walk at a level about 6 feet below the roof. A door in the inner wall

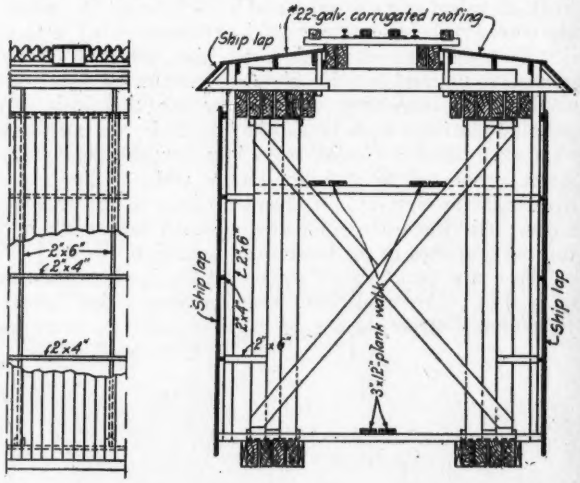


Roof Details—Through Spans on the Left, Deck Spans on the Right.

at each end of the truss affords entrance to the interior space, while a hatch in the roof at each panel point gives access to the nuts at the upper ends of the web tension members. A slot, adequately protected against the weather, is provided near the top of each wall for ventilation.

Deck Trusses Housed on Outside Only

The deck trusses are housed on the outside only, it being considered that the roof and the track floor afford adequate protection to the inside of the truss. The roof members extend only to the outer faces of the outer track stringers so that any rain falling on the track results in a drip through the enclosed space, but the depth of the stringers is sufficient to cut off any wind action so that this drip falls vertically and does not spray on the trusses. The ends of the trusses of deck spans where they adjoin trestle construction are also enclosed by shiplap sheath-



Deck Trusses are Sheathed on the Outside Only.

ing, which in this case extends across the full width of the span.

One problem which has had to be considered in developing the plans for these coverings is the great increase in the wind pressure on the truss because of the much greater exposed area. This, however, has been found to be a matter of minor importance in simple spans, but has thus far definitely precluded the use of the covering in the case of one or two swing spans over

navigable streams. Attempts to develop a housing for the individual members of the trusses of these swing spans have not been successful owing to the impracticability of obtaining sufficiently tight joints in enclosures of this kind in the face of the large deformation encountered in wooden trusses under the conditions imposed in the service of swing spans.

We are indebted for this information to R. J. Middleton, assistant chief engineer, Chicago, Milwaukee & St. Paul, Coast Lines, Seattle, Wash.

Railroads Report on Spray Painting

THE railroads have made extended use of the spray for the painting of cars; indeed, it may be said that spraying is the standard method of applying paint to freight cars on many roads. However, less progress has been made with respect to bridges and buildings. Replies to a questionnaire sent to maintenance of way officers of a considerable number of the railroads in this country showed that few of them were using the sprayer on their bridges and buildings and also disclosed the curious fact that only a relatively small number of them had even used the spray process experimentally on their structures, in spite of the general movement on the part of the roads of late towards the use of mechanical equipment as a means of saving labor. The situation is still harder to explain because the replies to the inquiry are generally favorable to the use of the sprayer. In only two cases was it definitely condemned. Because of the importance of this subject, the following resumé of the data contained in the replies to the questionnaire are presented as affording considerable information on the application of the paint sprayer to bridge and building work.

The Results Inside Are Favorable

The study of any subject concerning the application of a mechanical device naturally subdivides itself under three heads: Practicability, character of results, and comparative economy. Good results are indicated for the use of the paint sprayer in the application of coatings to large surfaces inside of buildings. The reports received on such work are uniformly favorable. Thus, the Michigan Central obtained excellent results in the painting of baggage and express rooms in the basement of the large Detroit terminal. Reports are almost equally favorable regarding the painting of large flat surfaces in the open air. Two of the replies testify to the unfavorable effect of high wind, one raising considerable objection on this ground, while the other mentions it only as a difficulty encountered. However, in view of the fact that much of the painting of box cars with spray equipment used so largely on the railroads, is done in the open air, this cannot be a serious objection. Moreover, a number of the roads report excellent results in outside painting of buildings and bridges. Thus the report from the Louisville, Henderson & St. Louis states: "We have gotten very satisfactory results, especially on wooden tanks and plate girder bridges." Both the Toledo, St. Louis & Western, and the Nickle Plate testify to good work secured on bridges and buildings with the sprayer.

Much of this spray painting has been done on large flat surfaces and reports indicate the most favorable results on such work. The painting of open lattice construction with the sprayer is obviously attended with some loss of paint, but with facilities for adjusting the width of the spray and the exercise of reasonable skill this loss may be considerably reduced. Moreover, the greater speed and ease with which the paint can be applied to intricate work and the facility it affords for reaching places virtually inaccessible to the brush, compensate largely, if not entirely for the loss of paint.

Some question is raised also as to the practicability of using the sprayer on bridge work that requires the use of scaffolds. Touching on this, the reply received from the Toledo, St. Louis & Western, reads as follows:

"There is less advantage in using the spray on the upper or overhead parts of a bridge or tank than on the lower parts, on account of difficulty in handling the paint tank and hose where the footing is bad." This objection does not seem to be borne out by the experience of others. Standard paint spray equipment calls for about 25 ft. of air and paint hose between the paint tank and the nozzle, a sufficient length to enable the painter to reach almost all parts of the top chord of a through truss span of ordinary size without raising the tank off the bridge floor. Where it is necessary to paint at height beyond the reach of a 25-ft. hose, suspending of the paint tank from the top chord with the aid of a fall line at any height required, obviates the need of placing the tank on scaffolding.

There has been a tendency on the part of the painters in some quarters to object or attempt to obstruct the use of spraying or mechanical equipment, but none of the replies to the questionnaire reports any such experience by the railroads, for, as stated by one of them, "As soon as the men learn to handle the equipment there is no desire to return to brushes."

All of the replies received point to favorable results in the coatings produced by the sprayer. The following statements are pertinent as regard to this:

"We find that the sprayer puts on a heavier coat of paint than the brush does, and causes the paint to enter crevices and cracks better than the brushes. The sprayers will reach places that cannot be reached with the brush."

"The quality of the work seems to be at least equal to brush work."

"The character of the work is fully equal to work done by brush, if not superior. We have gotten very satisfactory results."

"The work was very successful."

Little More Paint Used in Spraying

The question of economy involves two considerations —the relative amount of paint used as compared with brush work, and the relative amount of labor required to cover the same surface. As regards the amount of paint used, the following statements possess interest:

"We use but very little more paint with the spraying machines than we do with the brush."

"We use more paint with the spray than would have been required in brush work, especially on posts, bridges and open work, but with more experience we may be able to overcome this, at least to some extent. The wind is responsible for some of the paint lost."

"The amount of material used is very slightly greater for the spray, but not enough to be of any consequence."

The following are comparative figures for the cost of painting wooden tanks by hand and with the sprayer. It will be noted that the figures for the mechanical painting do not take into account the interest and depreciation on the equipment, but this is offset in part by the

fact that no allowance is made for cost of brushes used in the hand painting.

The average cost of painting by hand five wooden tanks of 40,000 gal. capacity each, on frame towers, was as follows:

104 hrs. at $ .54	$56.16
16 gal. paint at $2.25	36.00
	$92.16

Cost of painting one tank of the same size as above with a machine was as follows:

36 hrs. at $ .54	$19.44
19 gal. Paint at $2.25	42.75
3 gal. Linseed Oil	6.00
5 gal. Gasoline	1.25
	$69.44

The following figures for spray painting on railroad work may afford some opportunities for comparison with similar work done by hand on other railroads:

Cost of painting a 50,000-gal. tub on four 20-ft. latticed columns:

92 hrs. at $ .54	$ 49.68
20 gal. Paint at $2.25	45.00
4 gal. Linseed Oil	4.00
4 gal. Graphite Paint	6.00
6 gal. Gasoline	1.50
	$106.18

Cost of painting the girders only of a 1,310-ft. viaduct, (three lines girders about 6-ft. deep, making a total of 47,000 sq ft.)

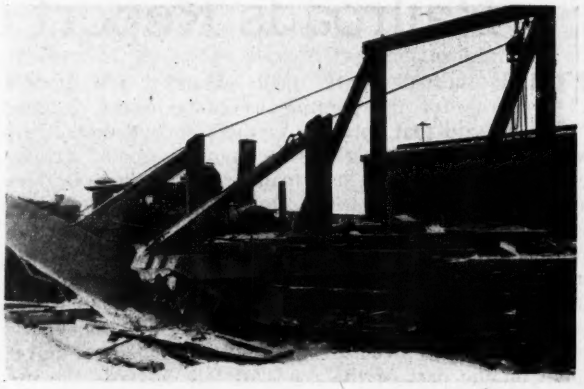
First Coat	—Labor—338 hrs. at $ .64	$248.32
	—Paint—355 gal. at $1.50	532.50
	—Gasoline—57 gal. at $ .25	14.25
		$795.07
Second Coat	—Labor—221 hrs. at $ .64	$135.68
	—Paint—239 gal. at $1.50	358.50
	—Gasoline—37 gal. at $ .25	9.25
		$503.43
Labor per 100 sq. ft. for 2 coats	—1.27 hrs. at $ .64	$ .82
Paint per 100 sq. ft. for 2 coats	—1.26 gal. at 1.50	1.89
Total		$2.71

Home-Made Ditcher Plow Proves an Economical Tool

FOR several years, the Toledo division of the Pennsylvania, has been making extensive use of a ditcher plow which was designed by the local officers and built on the division. The plow consists of a timber framework erected on a 100,000 lb. capacity steel underframe flat car and carrying a series of cutting blades and a scraper. The cutting blades comprise a set of steel plates in various lengths bolted to the supporting timber in parallel lines and arranged so as to form a templet to cut a standard ballast shoulder and ditch section. The scraper consists of structural steel plates which are shaped and fastened to the timber framework behind the templet in such a manner as to remove the material cut by the templet and also to give the ditch the desired slope.

The framework carrying the templet and scraper is reinforced at the ends of all timbers with iron plates and is hinged to the side of the flat car in such a way that it can be raised or lowered to adapt it to various cross sections when in operation, and also to permit the transportation of the car from one point to another, or to clear obstructions such as mileposts, rail rests and through bridges. This raising or lowering is accomplished by means of a two-man hand windlass operating two cables which run over sheaves carried on a gallows framework on the car. The plow frame is anchored to the car by adjustable iron rods and the car is counter-weighted with scrap car wheels held in place by wood pins.

The plow can be used for constructing and shaping ditches on level ground and in shallow cuts where the top of the cut is not more than one or two feet above



A Series of Steel Plates Cuts the Ditch Sections

the top of the rail. In such cases, it requires two or three cuts to form a completed ditch. It is also used for shaping roadbeds and ballast shoulders on fills. It is not adapted for the shaping of shoulders of stone ballast, but can be used for forming the sub-ballast, the roadbed and ditch sections beyond the edges of the stone ballast. In all of these operations, the plow is pushed by a locomotive and the material excavated is cast to the outside of the ditch.

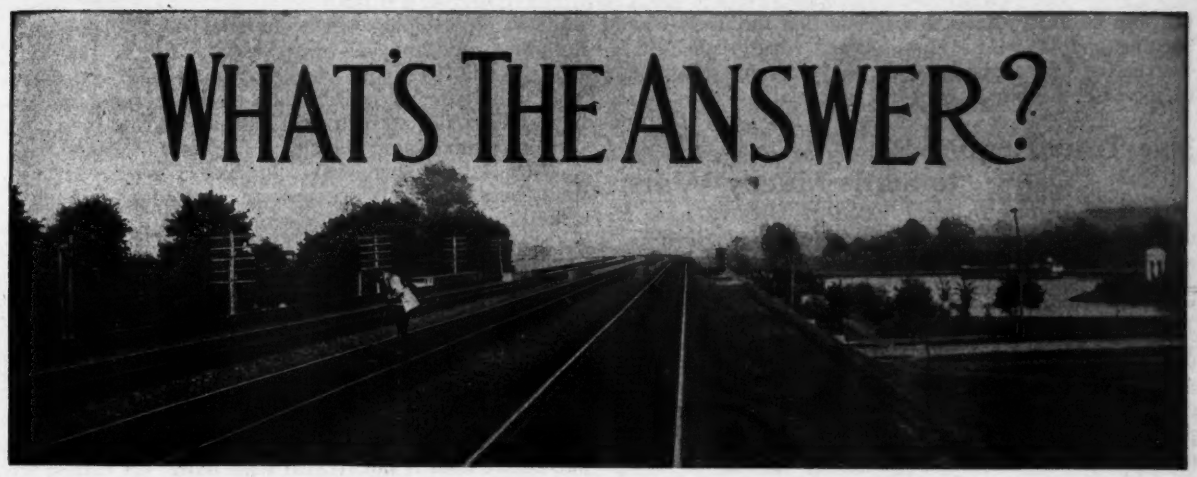
The plow was designed by Paul Jones, now division superintendent on the Pennsylvania, at Fort Wayne, Ind., and R. C. Miller, now division engineer at Harrisburg, Penna. It is reported to produce a more uniform section than can be obtained by hand-work or by teams with scrapers. It has also proved economical.

Records kept on the operation of the plow when it was used at points where the surface of the ground ranged

The Plow Is Raised and Lowered by a Hand Windlass

from about one foot below the top of the rail to two feet above it, show that about 11,060 lin. ft. of ditch was cut per average day of 8 hours, during which the plow was in use an average of only 2 hours and 44 minutes. At the rates then paid for labor, this was equivalent to a cost per lin. ft. of 1.1 cents, figuring 8 foreman hours per day at 55½ cents per hour, 40 trackman hours per day at 40 cents per hour, and a charge of $100 for work train service, making a total average cost per day of $120.44.

WHAT'S THE ANSWER?



This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

Answers to the Following Questions Will be Published in the October Issue

(1) *What are the relative merits of manganese rigid frogs and open hearth spring rail frogs for high speed main tracks?*

(2) *To what extent should holes be bored for drift bolts in timber bridges?*

(3) *What is the minimum practical size for small local passenger stations?*

(4) *Is any advantage to be gained by housing the settling tanks of water treating plants?*

(5) *Should joints be kept as tight where the road bed is soft, as where it is well supported?*

(6) *Should long reinforced concrete culverts be built continuous from end to end, or separated by transverse joints into independent sections?*

(7) *What type of foundation and floor construction is most satisfactory for section tool houses?*

(8) *Under what conditions, if any, is a dug well with sand points preferable to a drilled or bored well where the ground water is near the surface?*

Cleaning Stucco

What is the best method of cleaning stucco surfaces?

First Answer

Practically the only method of value for cleaning stucco surfaces is first to remove any loose dirt and then to apply a wash. Atlas white cement is recommended for this purpose. This cement should not be applied in the form of a mortar, but of a very thin consistency as a whitewash which is prepared simply by mixing the cement with water and applying with a brush. The surface is prepared for the wash simply by brushing with a stiff bristle brush, which should be done when the stucco surface is dry. If the first application of the wash is not sufficient to cover the old surface thoroughly a second coating should be applied. This method of cleaning the surface is well suited to smooth stucco and is particularly useful where the surface is rough as where pebbles are used.

Little can be accomplished by the use of muriatic acid solutions such as are used in cleaning glazed surfaces and the use of acid may be very injurious. As an illustration of this the writer recalls a brick building where it was desired to remove mortar and stain. In this case the acid did not remove the stain but it did injure the mortar by soaking into it. When muriatic acid is used for such purposes it should be sponged off immediately after application. A very smooth stucco surface like a cut stone surface may sometimes be cleaned by rubbing with stone but in railway service it is seldom that an advantage is gained by this method.

The cement wash will stand up satisfactorily for two years or more and also has the advantage of acting as a waterproof coating, especially where some waterproofing solution is added when applying the wash.

PETER AAGAARD,
General Building Inspector, Illinois Central, Chicago, Ill.

Second Answer

Interior stucco surfaces are largely soiled by an accumulation of dirt and grease which may be washed down readily and cleaned by the application of a mixture of water and some good cleaning compound, although considerable care must be exercised by the workmen in order to prevent the compound from running down or standing too long on one spot, thus streaking the surface. Exterior finishes which have become darkened through a combination of dirt and weathering present a somewhat more difficult problem and one which it is well to relegate to some one who has had experience along this line. Considerable improvement can be affected in the ordinary putty-dash type of stucco by washing it down with a stream of water under high pressure. This will dislodge the greater part of the dirt which has accumulated and clogs up the irregularities of the surfaces, although it will not remove any of the effects of weathering.

A more effective cleaning can be secured with wire brushes. Where these are used it is often quite difficult to secure uniform brushing, with the result that the surfaces frequently appear "patchy." Sand blasting

can also be used, although it is said that the use of sand blasting and likewise a motor driven wire brush have a destructive effect upon stucco surfaces, and also tend to increase the porosity of the material.

The Time Required to Settle Muddy Water

How much time should be allowed for settlement in designing or operating reservoirs used for clarifying muddy water as well as for storage?

First Answer

The time required for settling suspended matter out of water is a variable quantity, and is dependent on several factors, chief among which is the size and specific gravity of the particles in suspension. The temperature of the water and the character of the suspended matter also affect the time required for sedimentation.

It is practically impossible to estimate the time required for complete sedimentation where no coagulation is used. Heavy suspended matter will usually settle out without coagulation but the lighter particles and colloidal matter require the use of coagulants, usually aluminum sulphate (filter alum) or ferrous sulphate (iron) and sometimes lime, generally used along with the alum or iron, except in water softening.

Fair results are sometimes obtained with from 3 to 8 hours settling time but complete sedimentation without filtration will require from 24 to 48 hours to produce an absolutely clean water.

C. R. KNOWLES,
Superintendent Water Service, Illinois Central, Chicago.

Second Answer

Along the Yellowstone river in Montana the Northern Pacific has in operation three water stations with settling basins. At an intermediate water station last year an installation was completed which consists of two basins each holding 160,000 gal. of water. The river water is pumped into the settling basin at a rate of 600 gal. per minute. At the far end of the basin the water passes over a weir into a clear-water basin. From the clear-water basin the pump discharges into the elevated tank.

This installation has been very successful in clearing up extremely muddy water. The suction from the clear-water basin is obtained from three elevations so that the suction is always from the top water in the reservoir. From the experience obtained at this plant I would specify that not less than 10 hours should be allowed for settlement and where individual settling basins are employed without the use of weirs, 24 hours settling should be allowed.

The size of reservoirs should be entirely dependent on the amount of water used daily. They must be of sufficient capacity to give the desired time for settling for the maximum amount of water used. At the water station above mentioned, from 100,000 to 150,000 gal. of water are used daily. BERNARD BLUM,
Engineer of Maintenance of Way, Northern Pacific, St. Paul, Minn.

Third Answer

The time required for the settlement of mud in reservoirs varies with the river from which the muddy water comes. In the case of light flocculent mud, like that of the Missouri river through northern Montana and North Dakota, it also varies with the depth of the reservoir.

A pail of Missouri river water at flood time, set aside in the evening, will be found in the morning half flocculent mud and half misty water. By the next evening it will be about one-third mud and two-thirds water, the latter less misty than in the morning. In 36 hours from the start it will be one-quarter mud and three-quarters water, which can be used if necessary.

When I have such waters to settle I always arrange to by-pass about 10 per cent of the water through a large box containing milk of lime kept in suspension in the water. The top of the box is at the height of the main stream, so that the by-passed water enters the bottom of the box and issues near the top. This lime combines with the free and the half-bound carbonic acid in the water to form particles of carbonate of lime which at once attach themselves to the adjacent particles of mud and carry them to the bottom. Water so treated will settle nearly clear at the rate of two feet per hour, and is not only clear but also 10 grains per gal. softer than if not treated with lime. Of course the lime must be slaked before use. C. H. KOYL,
Engineer Water Service, Chicago, Milwaukee & St. Paul, Chicago.

Adjusting the Throw of Switch Stands

What is the best way to adjust the throw of a switch stand?

First Answer

There is only one proper way to adjust the throw of any kind of switch stand from the old banner rigid switch stand to the modern switch stand of the present. The track must first be put to gage exactly at the knuckle of the stock rail except on curves. Where extra gage has been allowed, extra gage must also be allowed when adjusting the switch stand. The switch point should be connected with the No. 1 switch rod so that it will give an opening of 4½-in. more or less, between the switch point and the running rail, depending on the location and other conditions. The connecting rod should be connected to the No. 1 rod first and the switch points should be split. If the opening is 4½-in. the switch points should be separated 2¼-in. from the rails and held there firmly.

The throw on the switch stand should also be split half way. Then, placing the switch stand at right angles on the switch ties, it should be spiked in place, being sure to have the crank screwed half and half on the target rod.

If the switch point does not fit snugly, the adjusting must be done by means of the connecting rod. This will necessitate spiking the switch stand only once. Any other way of adjusting the throw of a switch stand will result in spiking the stand two or three times and spoiling the switch head blocks to a great extent.

O. SUPRENANT,
Roadmaster, Delaware & Hudson, Schenectady, N. Y.

Second Answer

It is rather difficult to discuss the subject of adjusting the throw of a switch stand in view of the many different types and patterns of stands. Adjustable stands are those which are so constructed that the switch point movement may be increased or decreased by the use of an adjuster. There are several adjusting devices, including the screw pin, the eccentric, and the shim. The non-adjustable stand is one so built as to give a definite point movement which cannot be changed.

The procedure of adjusting a switch stand begins primarily in fixing the stand to the headblock ties, while the immediate operation of adjusting the throw follows

the placing of the stand on the headblocks. In setting the stand, it should be connected to the switch ready for operation when spiked. The switch points should then be opened exactly in the center of the lever's traveling distance. With the points and levers in this position, the pot or base of the stand should be properly lined for signal indications, and spiked. A stand so placed can be adjusted easily and quickly in either the screw pin or eccentric types, as one operation affects both points, while in the case of the shim adjustment, each point is adjusted separately. In the use of non-adjustable stands, the points are adjusted to the stock rails, generally by the use of turnbuckle rods. However, these rods do not affect the throw of the stand.

L. M. DENNY,
Supervisor of Track, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.

Applying Cement to Concrete Surfaces

Under what conditions is it advisable to apply cement wash to concrete surfaces? How should it be prepared and applied?

First Answer

A concrete surface should not be painted in any manner, either with a cement wash, or with any form of paint. Where cement washes are applied, it is only a matter of a few years before the grout forming the wash will scale and peel off, leaving an unsightly surface.

Where finished concrete work presents a poor surface, its appearance can sometimes be improved by pointing any honeycomb holes that exist with a mortar of the same composition as used in the aggregate and then paint the surface with a grout of the same composition, carefully rubbing it with a float to remove all excess material.

Any form of cement wash is usually a "makeshift" to cover up poor workmanship, and concrete which will have exposed surfaces should be so finished as not to require painting. Current specifications make no mention of cement washes and they are decidedly contrary to the best accepted practice. L. D. HADWEN,
Assistant Engineer, Chicago, Milwaukee & St. Paul, Chicago.

Second Answer

The practice of applying cement wash to concrete surfaces is one that is too frequently used by contractors and concrete construction men to correct surface defects. It can hardly be recommended as good practice and, in general, I am opposed to it.

It is no doubt true that a very fine appearing surface can be obtained by washing with cement grout, but this effect is not permanent. The thin veneer has a tendency to craze, check and fall off in flakes, with the result that the surface soon presents a worse appearance than if it had been left untouched.

A properly mixed, well spaded concrete, when cast in forms carefully constructed needs little if any finishing after the forms are removed. Usually the only treatment necessary consists of rubbing the surface, while wet, with carborundum bricks or other similar abrasives. This removes the form marks and leaves a surface that is permanent.

Rough or "honeycomb" spots due to insufficient spading may be plastered as soon as the forms are removed, but no mortar should be applied except to fill distinct holes or cavities. Uneven surfaces due to faulty forms should be smoothed down by rubbing and not by plastering. The same cement and the same mixture of cement and sand as that used for the concrete should be used for plastering in order to match the color of the concrete. And finally, before the mortar has set, the surface should be rubbed in such a manner as to present as uniform an appearance as possible.

The foregoing remarks are intended to apply to the general run of railroad concrete structures. There are of course many instances where a special surface finish is desirable. Many fine finishes are made possible by working the surface with special tools, by washing with acid or scrubbing with wire brushes, or by sand blasting, but these finishes are rarely required, except in architectural or special bridge structures, and should not properly be considered in a discussion of the question which forms the subject of this article.

J. E. BEBB,
Assistant Bridge Engineer, Michigan Central, Detroit, Mich.

Third Answer

The proper finish of exposed concrete surfaces should be governed by the character of the structure. If its character and its location are such that the natural surface is objectionable, and that the marks of the boards, roughness, and flat and dead surfaces are displeasing, a suitable surface may be obtained by applying some special treatment. After the forms are removed, the surface of the concrete may show the joints, knots and the grain of the wood which has the appearance of a piece of rough carpentry work. The failure to spade the surface next to the forms properly will invariably cause rough places or stone pockets. Another common imperfection is a variation in color. The failure to remove from the inside of the forms any dry mortar is still another reason for roughness. An excess of water in the concrete will cause sandy surfaces in spots and sometimes will run the full height or length of the section.

When patching small cavities, rough surfaces or stone pockets of considerable size, care is oftentimes not exercised in matching the proportions of the mortar used in order to obtain about the same color as that of the concrete itself. All rough surfaces should be dressed down with a carborundum brick.

The above are several reasons why it may be advisable to apply the cement wash to obtain a uniform looking surface. The cement wash should be applied as quickly as possible after the forms have been removed, otherwise it will not adhere to the concrete for any length of time. It should be made of a very thin grout of the consistency of whitewash, mixed in the same proportions as the mortar of the concrete itself. The wash should be applied with a wide brush.

F. H. CRAMER,
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago.

The Best Finish for Hardwood Floors

What is the most practical finish for hardwood floors in railway offices?

First Answer

A durable and practical finish for a maple or other non-porous hardwood floor is to apply a coat of shellac and then two coats of floor varnish. For oak, ash and other porous hardwoods a filler should first be used followed in order with one coat of shellac and two coats of floor varnish. Shellac is suggested as a primary coat where a filler is not needed for the reason that it does not have a tendency to darken or stain the floor as linseed oil will do. Varnish contains linseed oil. Again, a practical painter will suggest the use

of varnish on top of shellac for the reason that it is more elastic and will not mar or scratch as readily as the shellac does.

FRED C. RIEBOLDT,
Master Painter, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.

Second Answer

It is customary to fill hardwood floors with paste wood filler, followed with two coats of liquid wood filler, with desired stain and wax when needed.

H. A. HORNING,
Superintendent of Buildings, Michigan Central, Jackson, Mich.

Third Answer

The most practical finish for hard wood floors in railway offices differs for different woods. For new yellow pine, rift-sawed or flat grain, two coats of orange shellac are good. The first coat should be sand papered using No. 00 paper. This makes a good finish. One coat of dull finish first grade floor varnish improves this somewhat. Another treatment for yellow pine, rift-sawed or flat grain is to use three coats of the best grade of floor varnish obtainable. If a high gloss is desired, a high gloss finish should be applied, sand papered with No. 00 paper, rubbed with the grain. For the second coat a dull finish should be used, sand papering as for the first coat. The third coat should be a high gloss varnish. This makes a very desirable finish. Alkali powders or soap should not be used when cleaning floors that are shellaced or varnished. If it is necessary to use water, a good oil soap should be used, having no free alkali.

For oak, ash or chestnut, open grained woods, a natural paste filler should be applied. If a dark color is desired, a dark filler should be used with the usual treatment. If a wax finish is desired, orange shellac should be applied and properly sandpapered followed by wax well polished. If a varnish finish is desired, a paste filler should be used as above, after which three coats of the best floor varnish obtainable should be applied. The first two coats should be sandpapered with No. 00 paper. If a high gloss is desired, high gloss varnish should be used; if a dull finish, dull finish varnish. Three-coat work is preferable, but two-coat work is very satisfactory.

Nearly all office floors are yellow pine. The first formula is my choice. Many use an oil stain. We do not use oil on floors.

SUPERVISOR OF BUILDINGS.

Oiling Angle Bars in Track

What are the advantages of oiling angle bars in track? How can this be done economically by section forces?

First Answer

The advantages obtained by oiling angle bars in track are as follows: In the first place it protects the bars and bolts against the ravages of rust and refrigerator brine. On lines with considerable refrigerator traffic, brine drippings may weaken the bars to such an extent that frequent failures make it necessary to replace joints in long stretches of track. And even if the bars hold up during the first installation they are usually fit only for scrap when released. The same holds true with the track bolts.

A second advantage is that well-oiled joints are kept tight with much less expenditure of labor than if allowed to rust.

Two or more men with pails and some old three or four-inch paint brushes can apply the oil most economically. When this is done by section forces the weather should be warm to insure a ready flow of oil and its entrance into small spaces about the angle bar and bolts.

Some sort of light machine for spraying the oil onto the joints would cut the labor cost and accomplish the desired purpose much better than painting, for such a spray would reach parts that cannot be reached with a brush.

B. M. CHENEY,
General Inspector, Permanent Way and Structures, Chicago, Burlington & Quincy, Chicago.

Editor's Note

Supplementing his answer on oiling track fastenings Mr. Cheney has submitted a copy of a reply made to a questionnaire sent out by the American Railway Engineering Association which shows that on the Burlington, where oiling has been practiced for four years, the oiling is done twice yearly in brine territory when the entire rail is oiled and once yearly on other main lines and where only angle bars and bolts are oiled. It is also the practice to oil the inside face of all angle bars and the part of the rail covered by the angle bars before applying such bars. The requirements are about 54 gal. of oil per mile where a machine is used in oiling the entire rail and 8 to 10 gal. per mile where only angle bars and bolts are oiled by hand. The labor for machine oiling is 81 cents per mile.

Second Answer

The advantages of oiling angle bars and track are several. In the first place it decreases the wear of the track fastenings. Second, the nuts on oiled bolts are more easily turned with a wrench and are more easily removed than by cutting. Third, snow and ice will not adhere to the oiled surface and will slack away from oiled joints so that the entire bar and bolts are always visible for inspection. Fourth, in requiring section gangs to oil rail fastenings their attention is brought to loose bar and bolt connections much quicker than if they went over the section only to tighten bolts. The moral effect of oiling joints cannot be over estimated. Finally, oiled joints prevent corrosion of the surface of the rail fastenings.

The most economical way to do the oiling is to use two men out of a section gang, or if the size of the gang will permit, four men, giving them 5-in. wall brushes and about two gallons of railway oil with an asphaltic base. I have found that this work can be done at a cost of from $6 to $10 per mile.

GEO KOONTZ,
Division Engineer, St. Louis-San Francisco & Texas, Fort Worth, Tex.

Renewing Stringers in Wooden Bridges

What is the most practical and economical method of renewing stringers in wooden bridges?

First Answer

Wooden stringers in trestles can be renewed easily with I-beam chords. The I-beam chord is placed outside of the ties on the caps. The chord bolts are first removed from the wooden stringers after which jacks are placed on the caps in the center of tracks and the ties raised a sufficient height so that the wooden stringers can be slipped out between the ends of the ties and I-beams. The I-beam chord can then be pushed in place on small rollers and the ties jacked down to a bearing on the steel chords.

I-beams riveted together in chords will prove more economical when considered over an extended period and will reduce the tendency to catch fire from locomotives. The first cost of the material is more than that

for wood stringers but this expense is partially offset by a saving in the labor of placing the steel stringers over the others. One set of I-beam chords should outwear at least four or five sets of wood stringers.

J. S. HUNTOON,
Assistant Bridge Engineer, Michigan Central, Detroit, Mich.

Second Answer

The best method to follow in renewing stringers in wooden bridges will depend to some extent on the design of bridge but in general, with the designs now in common use, consisting of stringer chords built out of timber ranging from 7-in. by 14-in. to 10-in. by 18-in., and resting directly on the caps, the following method will be found advantageous from the standpoint of safety and economy.

The stringers for each chord are laid out end to end on a level skidway close to the end of the bridge. This skidway is conveniently made by taking ties to be used in the new bridge and lacing them at intervals of about four feet between the track ties. Having carefully measured the distances center to center of caps, the stringers are cut to correspond, the ends framed for an even bearing on the caps and all the holes bored for the packing bolts, after which the chords are ready to be placed in the bridge.

By means of a hand windlass rigged up on a push car with a hoisting beam overhanging one side of the car, the stringers are carried out and set in place on the outer end of the caps, one line of the chord at a time. The lining bolts and fastenings to the caps of the old chord having been removed and the deck raised about one inch with jacks, the old chord is shifted toward the center of the bridge followed by the shifting of the new chord, one line at a time, into its place. The other new chord is then placed on the end of the caps and the performance repeated, whereupon both the old chords are crowded off at the opposite side of the bridge leaving the new chords in proper position. The chords are then lined up so as to get in the packing bolts, for which the holes are already drilled, and for placing the lining bolts and fastenings to caps.

By this method the ties and guard rail are not disturbed. At no time is the bridge unsafe for slow speed traffic and the work can be handled economically with a crew of a foreman and eight men.

Where one stringer of a chord is found decayed it can easily be replaced if on the outside by removing the bolts and sliding a new member into its place. If on the inside or center of the chord it is usually practicable to reinforce the span by an additional short stringer which will answer for the short period until the entire chord will require renewal.

EDWIN M. GRIME,
Supervisor Bridges and Buildings, Northern Pacific, Fargo, N. D.

Water Injection for Gas Engines

What is the purpose of injecting water into internal combustion engine cylinders, and is the practice to be recommended?

First Answer

The object of water injection in gas engines fundamentally is not one of promoting combustion but of effecting cooling. Independently of mechanical details a gas engine is rated on its ability to radiate the heat produced by the combustion. By the cooling effect produced, it is thus possible with water injection to increase the power that an engine can produce. That this can be done is well established. An illustration is a test made by the writer some time ago where a typical engine developing 8-hp. under brake test, when cooled only by jacket water immediately developed 10-hp. with water injection. The effect of water injection is not only the direct cooling which takes place, however. Water which is evaporated in the cylinder is turned into steam and then to superheated steam. This converts into power heat which otherwise is absorbed by the jacket water and thereby lost.

To recognize the advantages of water injection, however, is not necessarily to advocate its use on pumping engines and on railroads, as a serious objection to water injection in such cases is the necessity of using water which carries sand, mud, or dissolved impurities which will soon put a cylinder into which water is injected out of commission. Also the additional items of fuel and water injection seem to be too much for the mentality of most attendants. As a result, the economies which could be worked out with water injection where understood, must give way to the more important question of dependability.

The Rock Island has a number of engines in service providing water injection, but a number of failures have occurred as a result of neglect, and water injection as a general rule is not recommended.

P. M. LA BACH,
Engineer Water Service, Chicago, Rock Island & Pacific, Chicago.

Second Answer

Various claims have been made for water injection in internal combustion engines, one of which is that the water increases the power of the engine, presumably through increasing the expansive force of the explosion by reason of the water flashing into steam. The claim has also been made that the water assists lubrication and reduces carbonization.

Professor Banki used the water injection for the purpose of securing higher compression without pre-ignition, the water keeping the temperature of the charge down and it was probably in this way only that the practice was beneficial. As a general rule it is not to be recommended and many of the larger manufacturers have abandoned the practice. C. R. KNOWLES.

Third Answer

It should not be inferred from the foregoing statements that water injections should never be attempted in railway service. While it is entirely correct that little benefit is to be derived from water injection in general and that harm may result owing to unintelligent handling, there are doubtless numerous instances where water injection can *actually* be utilized to advantage and where it is profitable even to improvise a water injection process if the engine does not provide for it. An illustration of this is an engine which is so overloaded as to explode on practically every stroke and require constant attention to keep it running. The solution of this problem may better be the installation of a larger engine or the use of a larger pipe line, but where for the time being at least, there is no alternative but to get along with the existing equipment, it will often happen that the injection of a little water into the cylinder will help matters greatly. Again where for some reason the exhaust pipe becomes so hot as to impede the operation of the engine, a little water also may be injected into the exhaust pipe to advantage. In either case, the factor of carelessness on the part of the attendant is not likely to arise if the theory of water injection is explained to him, since it is much to his interest and peace of mind to avoid the engine trouble.—[Editor.]

Labor Board Remands Wage Case

Recognition of Local Conditions Marks New Departure in Decisions by this Body

ALL PARTIES concerned in the hearing on the application for an advance in wages before the Labor Board, presented by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, as reported in recent issues of *Railway Engineering and Maintenance*, looked forward with great interest for the forthcoming decision by the board, because the circumstances surrounding the case were such as to make it extremely difficult for the board to arrive at a blanket decision along the lines followed in the previous findings of that body. The board, however, saw fit to relieve itself of the burden of a definite decision in the face of these complications by an announcement dated June 30, remanding the cases to the parties under dispute for further conference.

In refusing to approve the blanket increases asked by the labor organization, the board recognized the fact that the agreements which have already been made on 60 per cent of the total mileage of the railroads in the country have been made after consideration of local conditions. This recognition by the board of the preponderance of local conditions is a new departure for that body and indicates that the old method of ordering blanket increases is to be less in favor in the future. Probably the greatest obstacle to a decision lay in the fact that the employees were demanding increases ranging from 8½ to 15 cents whereas the agreements reached between many of the railroads and their maintenance of way employees provided for increases much less in amount. An abstract of the board's decision follows:

"The agreements which have been entered into between the organizations parties hereto and the various carriers, on file with the Railroad Labor Board, show a gratifying willingness on the part of the carriers to grant increases of pay justified by conditions, and a commendable disposition on the part of the employees not to insist on exorbitant demands.

"The evidence before the Board clearly shows—and it may also be said that it is a matter of common knowledge—that there has been during recent months a decided upward trend in the scales of wages paid in other industries for work that is similar to and fairly comparable with the work performed by the various groups of employees comprised in the maintenance of way department. While this movement has been general, it has not been uniform by any means, and this fact doubtless accounts in a large degree for the lack of uniformity in the wage agreements entered into by the carriers and the employees.

The request made upon the Board is for a blanket increase of from 8½ to 15 cents per hour for the various groups of employees. These figures are greatly in excess of those to which the employees have agreed in the settlements recently made by them. Moreover, the voluntary agreements of the employees and carriers have not been general in application, but applicable, respectively, to individual roads, and the board therefore feels justified in remanding these disputes to the respective parties for the purpose of again discussing this matter in conference in an effort to reach an agreement.

"The wage dispute between the Pennsylvania System and its maintenance of way employees is not passed upon by the Board in this decision for the reason that this carrier recently made certain voluntary increases of the rates of pay of such employees, the exact nature and extent of which are not in evidence, and decision will therefore be withheld until the Board, under the general powers conferred upon it by the Transportation Act, 1920, can investigate and ascertain the facts.

"Decision.—For reasons stated in the foregoing opinion, and with the belief that if reasonable effort is exerted by both parties to the dispute an amicable adjustment can be reached, the Railroad Labor Board remands these cases to the parties hereto for further conference, with the understanding that any agreements arrived at shall be made effective June 1, 1923."

New Decisions in Contract Cases

In the case involving the Maintenance of Way Brotherhood and the Western Maryland with respect to the contracting of maintenance of way work, the Labor Board handed down a decision on June 18, declaring that the railroads' agreements with the contractors were outside of the law in so far as they purported to remove the employees from the application of the act. In each instance the claim was made by the unions that the carrier, in entering into contracts, had violated the transportation act and the rules and wage decisions of the board. In disposing of the cases, the board ruled that the employees are under its jurisdiction and subject to the application of the rail act as well as the board's decisions. It also directed the Western Maryland to take up with any employee the matter of reinstatement upon the employee's application.

Erie Liable for Money Return to Employees

In a decision issued on July 19 the Labor Board declared that the Erie has made itself liable for a money recovery to every employee who suffered loss of compensation when the carrier arbitrarily reduced the wages of the crossing watchmen, flagmen and trackmen in violation of decision No. 147 of the Board. This proceeding is the result of a failure on the part of the road to comply with the Board's Decision No. 1219 rendered in the case of the American Federation of Railroad Workers against this carrier. The classes of labor involved in the dispute were contracted out to the Lincoln Engineering Company at an hourly wage of 5 to 10 cents lower than the prevailing wage of similar classes of railroad workers on other railroads, as established by Decision No. 147 of the United States Railroad Labor Board.

On September 8, 1922, the Board rendered Decision No. 1219 in which it held as follows:

"That the Erie Railroad Company violated Section 301 of the Transportation Act, 1920, by its failure to confer with the employees' duly authorized committee before it entered into the contract with the Lincoln Engineering Corporation;

"That the Erie Railroad Company violated Decision No. 120, issued by the Labor Board under date of April 14, 1921, when it turned the employees involved over to the Lincoln Engineering Corporation; and

"That both the Erie Railroad Company and the Lincoln Engineering Corporation violated Decision No. 147, issued June 1, 1921, when they put into effect rates of pay below those set forth in said Decision No. 147."

The opinion of the Board as expressed in its decision is in part as follows:

It developed at the hearing of this case that some of the employees involved in this dispute had, subsequent to the issuance of Decision No. 1219, been taken from under the contractor and again placed upon the payroll of the carrier, but without any change in the rate of pay from that paid by the contractor. When the carrier reduced the compensation of its said employees who were engaged in work customarily incidental and practically indispensable to the operation of the road, it not only violated the decisions of the Labor Board, as above recited, but it annulled an established condition equivalent to an agreement and violated the Transportation Act itself.

In the present case, however, the Erie Railroad Company had put into effect the rates of pay for these employees fixed by the

Board's Decision No. 147. Having done this, the carrier could not lawfully reduce these rates except by the collective consent of the employees or by the approval of the Railroad Labor Board. The carrier, under the law, might have declined to accept Decision No. 147, but, having put it into effect, could only reduce its rates by complying with the mandatory provisions of the statute which require, in case of disagreement, the submission of the question to the Board. In other words, while the final decision of the Board is advisory, the preliminary steps leading up to the decision are mandatory and enforcible. When the carrier arbitrarily reduced the wages of these employees as fixed by Decision No. 147, for several months effective on its property, it violated the Transportation Act, 1920, and rendered itself liable for a money recovery to every employee who suffered such injury.

Decision.—The Railroad Labor Board decides that the Erie Railroad Company has violated Decision No. 1219 of the Board, and is wilfully and knowingly persisting in such violation in contempt of the opinion expressed by the Board in that decision and in contravention of the public welfare.

Roads Announce Further Advances in Wages

Following the remanding of the wage dispute between the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers and a number of the roads, some individual settlements have been negotiated.

The Chicago Great Western has granted increases as follows: bridge and building foremen and their assistants, $6.84 a month; section foremen, $6.84 a month; assistant section foremen, 2½ cents an hour, and mechanics two cents an hour; mechanics' helpers, one cent an hour; track laborers, one cent an hour; bridge tenders and watchmen, one cent an hour. Practically 2,900 employees are involved, the aggregate annual increase per annum being $100,000.

The Spokane, Portland & Seattle has approved the following increases to its maintenance of way employees: bridge and building foremen and their assistants, $10 a month; section foremen and their assistants, $5.84 to $8.84 a month; mechanics, 3¼ cents an hour; mechanics helpers, two cents an hour; track laborers, two to three cents an hour; drawbridge tenders and watchmen, three cents an hour; pumpers, cranesmen and firemen, $6.12 a month.

Mechanics and helpers in the maintenance of way department of the Delaware, Lackawanna & Western have been granted an increase of two cents an hour while apprentices on the same roads received an increase of one cent an hour.

The Lehigh Valley has granted increases effective April 1, as follows: track foremen and assistants, $5 a month; bridge and building foremen and assistants, $2.50 to $3.50 a month.

Automatic Signals and Motor Cars

THE St. Louis-San Francisco has adapted automatic signals to the operation of the motor cars by its maintenance of way and signal forces in a way that is both novel and interesting. Wherever a track runs through tunnels of considerable length, over long bridges, or around a series of curves in broken country where the view is obscured, the operation of motor cars is attended by increased hazards unless precautions are taken which delay the operation of the cars. To meet this situation at several points on the Frisco, advantage was taken of the presence of automatic signals to install switch indicators at those points which would give motor car operators information concerning the presence of trains in the obscured sections of track ahead. These indicators operate in the same manner as at switches. If they indicate a clear block ahead the operator is warranted in proceeding without delay while if a train is in the block he receives advance warning.

Traction Wheels For Osgoods Steam Shovels

THE OSGOOD COMPANY is now making traction wheel mountings for large railway type steam shovels, as a substitute for the standard railroad trucks. The innovation has resulted primarily from a desire to eliminate much of the time ordinarily required in moving the large shovel, an item of especially large proportions where the shovels are used in places where blasting operations are in progress, necessitating under the customary arrangement the laying of track to move the shovel back from the face of the excavation and then up again after the explosions have been set off.

The new mounting, as the illustration shows, consists of four traction wheels which in this particular case measure 6 ft. in diameter, with the front wheels 36 in. wide and the rear wheels 30 in. The front wheels are used as drivers and power is transmitted through a series of gears from the hoisting engines, while the steering is accomplished by turning the rear wheels. The reversing engine for driving the wheels as well as the steering is accomplished by means of a single lever from the engineer's position in the forward end of the cab.

While the wheels constitute but an application of an old principle, it is expected that this form of mounting

The Osgood 120-16-yd. Shovel Fitted with Traction Wheels

will greatly enhance the use of the large type steam shovels in disadvantageous locations. As an illustration of the improvement effected in the dispatch of the work, recent tests made in a Pennsylvania stone quarry brought out the fact that the shovel was moved a distance in one day that under old track laying methods would have required about ten days. The tracks and wheels also eliminate the necessity of pitmen and the use of jack arms, both of which features add considerably to the cost of operating the large shovels. Aside from the advantages mentioned, it is claimed that the traction wheels are an improvement over the railroad track mounting by reason of the greater simplicity both in design and from the standpoint of operation. They are said also to afford a reduction in the side strains and racking of the machine usual with the track type of mounting. The service tests made of the traction wheel mountings on the Osgood 6 cu. yd. shovel having proven satisfactory, similar mountings are now being manufactured also for the 5 cu. yd., the 3½ yd., and the 2½ and 3 yd. shovels.

NEW SIGNALS—Approach signs for highway crossings, illuminated day and night by acetylene flashlights, are to be erected at a large number of locations in the city of Montreal. These signs will be installed under a contract with the city, continuing for a period of five years, with the expectation to dispense with the services of watchmen.

American Railway Engineering Association

Members of the Association have been selected to report at the next meeting of the International Railway Congress in London in 1925 as follows: G. J. Ray, chief engineer, Delaware, Lackawanna & Western, on (a) different methods of maintenance and repair of track by company forces, by contract and by piecework or premium system; mechanical appliances, etc.; comparisons from the technical and economical points of view; (b) dispensing with crossing watchmen; visibility of the trains from the crossing; warning notices and signals, etc.: Samuel T. Wagner, chief engineer, Philadelphia & Reading, on classification yards for freight trains; layout and organization; W. H. Elliott, signal engineer, New York Central, fixed signals—principals of signaling for lines with dense traffic and for large stations; form of day and night signals; signal lights, automatic block signals: W. C. Cushing, engineer of standards, Pennsylvania System, Philadelphia, on the breakage of rails.

The Board of Directors of the American Railway Association has approved a recommendation of the Board of Direction of the engineering division that a joint committee on electric traction be organized with representatives of the construction and maintenance, electrical and signal sections of the engineering division, of the telegraph and telephone section and of the mechanical and operating divisions.

Bridge and Building Association

The following is the detailed schedule of the special train which will be provided for those members living east of Chicago en route to the convention at Seattle, Wash., together with the program at the convention itself. One or more cars will be operated from New York via the Pennsylvania, connecting with the special train at Chicago and other cars from St. Louis and Kansas City will be attached to the train at Lincoln, Neb. The Gowman Hotel has been selected as the headquarters for the convention.

Saturday, October 6..... Leave Chicago at 11:00 p. m. via C. B. & Q.

Monday, October 8..... Arrive at Denver, 7:00 a. m. Visit new shops of C. B. & Q. railway. 8:00 p. m. meeting with the Colorado Engineering Council at which an illustrated address will be delivered on the Railroads of the Rockies.

Tuesday, October 9..... Leave Denver 2:30 a. m. via D. & R. G. W., stopping en route at the Hanging Bridge at the Royal Gorge, at Glenwood Springs and at Soldier's Summit and arriving at Salt Lake City at 10:45 a. m. October 10.

Wednesday, October 10... 1:15 p. m. Leave for inspection of Southern Pacific trestle over Great Salt Lake. 8:00 p. m. Leave Ogden via Oregon Short Line, stopping at Baker, Ore., on the following day to visit the mills of the Baker White Pine Lumber Company and arriving at Portland at 7:00 a. m., October 12.

Friday, October 12..... Visit saw mills and timber treating plant of Charles R. McCormick Company at St. Helens, Ore.

Saturday, October 13.... Visit logging operations along Columbia river west of Portland.

Monday, October 15..... Visit saw mills of the St. Paul & Tacoma Lumber Company and study teredo attacks on timber structures in harbor at Tacoma, arriving at Seattle at 6 o'clock that evening.

CONVENTION PROGRAM

TUESDAY, OCTOBER 16

10:00 a. m.—Opening exercises.
Address of president.
Report of Committee on Tool Equipment for Bridge, Building and Water Service Gangs.
Report of Committee on Heating Small Passenger Stations.
Report of Committee on Methods of Installing or Replacing Culverts, Sewers and Pipe Lines Under Traffic.

8:00 p. m.—Technical program.

WEDNESDAY, OCTOBER 17

9:00 a. m.—Report of Committee on Renewal of Ballast Deck Trestles.
Address by M. Nicholson, general manager, Western lines, Chicago, Milwaukee & St. Paul.
Report of Committee on The Relative Merits of Concrete, Cast Iron and Corrugated Metal Pipe Culverts.
Report of Committee on Water Facilities at Stockyards.
Paper by George W. Rear, bridge engineer, Southern Pacific.

7:00 p. m.—Annual dinner.

THURSDAY, OCTOBER 18

9:00 a. m.—Report of Committee on The Practicability of a Uniform Painting Program for the Entire Year.
Closing Business, including election and installation of officers and selection of meeting place.

Roadmaster's Association

The officers and members of the executive committee met at the Hotel Sherman, Chicago, on July 7 to plan for the forty-first annual convention which will be held in that hotel on September 18-20. The tentative reports of four of the five committees which are to be presented at the convention were reviewed and returned to the chairman for completion. The program for the convention was drawn up and approved and arrangements were made for the presentation of two or three special papers on subjects of timely interest. It is planned to hold three sessions of the convention on Tuesday, two on Wednesday in addition to the annual dinner, and to adjourn on Thursday noon in order to afford an opportunity for an inspection of one of the large steel mills near Chicago.

The members of the Executive Committee of the Track Supply Association also met at the Hotel Sherman, Chicago, on July 7, to complete plans for their exhibit, which will be presented during the convention of the Roadmasters' Association. In addition to the exhibitors reported in the June issue, the following companies have taken space and will present exhibits, making a total of 51 exhibitors.

Buda Company, Chicago.
Carbic Manufacturing Company, Duluth, Minn.
Chipman Chemical Engineering Company, New York City.
Creepcheck Company, Hoboken, N. J.
Hauck Manufacturing Company, New York City.
Indiana Piston Ring Company, Hagerstown, Ind.
Northwestern Motor Company, Eau Claire, Wis.
Selflock Nut & Bolt Company, East Syracuse, N. Y.
Woolery Machine Company, Minneapolis, Minn.

In addition the Cleveland Frog & Crossing Company, Cleveland, Ohio; the Frog, Switch & Manufacturing Company, Carlisle, Pa.; the Pettibone-Mulliken Company, Chicago, and the St. Louis Frog & Switch Company, St. Louis, Mo., have taken membership without exhibits.

PROGRAM FOR THE ROADMASTERS' CONVENTION

Hotel Sherman, Chicago, September 18-20
Daylight Saving Time
(One Hour Ahead of Central Standard Time)

10:00 a. m. Convention called to order by president.
10:10 a. m. Address "Selling the Railroads to the Public," by Hal S. Ray, assistant to the president, Chicago, Rock Island & Pacific, Chicago.
10:40 a m. President's address.
11:00 a m. Appointment of committees.
11:10 a m. Report of Committee on the Maintenance of Large Yards.
12:30 a. m. Adjournment.
2:00 p. m. Paper on "Reducing Injuries Among Trackmen," H. M. Mayo, superintendent of safety, Southern Pacific Lines, Houston, Tex.
2:45 p. m. Report of Committee on Laying Rail and Applying Ballast on Double Track Lines with Single Track Operation.
3:30 p. m. Paper on "Securing the Maximum Life from Ties," S. D. Cooper, assistant manager treating plants, Atchison, Topeka & Santa Fe System, Topeka, Kan.
5:00 p. m. Adjournment.
7:30 p. m. Special evening program.

Wednesday

9:30 a. m. Report of Committee on the Training of Section Foreman.
10:30 a. m. Address on The Roadmasters Part in the A. R. A. Program.
11:15 a. m. Address by Colonel F. G. Jonah, assistant to president and chief engineer, St. Louis-San Francisco, St. Louis, Mo.
11:45 a. m. Paper on "Maintenance of Joints," by R. S. Cochrane, chief engineer's office, A. T. & S. F.
12:30 a. m. Adjournment.
2:00 p. m. Report of Committee on Standards of Maintenance of Light Traffic Branch Lines.
3:00 p. m. Address by W. G. Bierd, president, Chicago & Alton, Chicago.
4:00 p. m. Adjourn to visit exhibits of the Track Supply Association.
6:30 p. m. Annual dinner of the Roadmasters' and Track Supply associations.

Thursday

9:30 a. m. Report of Committee on Labor Saving Devices.
10:30 a. m. Business session.
Reports of officers and committees.
Election of officers.
Selection of meeting place for next convention.
Adjournment.
1:30 p. m. Inspection of rail mill of the Inland Steel Company, Indiana Harbor, Ind.

Metropolitan Track Supervisors' Club

In an effort to promote more efficient and economical methods of maintaining tracks, the Metropolitan Track Supervisors' Club, of New York City, has organized a committee to study and report on the screening of ballast by mechanical power. This committee consists of J. H. Cooper, supervisor, Penna., New York City, chairman; W. E. Pettigrew, assistant division engineer, B. & O., New York City; M. Deniff, supervisor, Erie, Jersey City, N. J.; Ralph Haring, supervisor, L. I., Jamaica, N. Y.; I. D. Talmadge, roadmaster, N. Y., O. & W., Middletown, N. Y.; N. A. Schutz, assistant supervisor, C. of N. E., Poughkeepsie, N. Y.; P. A. Savage, assistant engineer, N. Y., N. H. & H., New Haven, Conn.; W. A. Clark, supervisor, P. & R., Trention Junction, N. J.; M. Griffin, supervisor, C. R. R. of N. J., Jersey City, N. J.; A. M. Clough, supervisor, N. Y. C., Batavia, N. Y.; F. T. Fish, supervisor, Penna., Bordentown, N. J., and C. J. Coon, supervisor, N. Y. C., New York City. The first meeting of this committee was held at Boonton, N. J., on July 19, where the operation of the Maintenance Equipment Company's power ballast screen was studied. All of the members of the committee were present at this meeting with the exception of Messrs. Talmadge, Clark and Clough. A number of non-members also attended.

The Material Market

THE list of iron and steel prices below shows practically no change between the quotations for June and July. However, all indications point to the fact that the present prices are weak as compared to those of the previous month, a condition that is manifested by the more favorable deliveries which the buyers can now secure for the same prices. There is also some tendency to shade prices although such deviations are not given publicity. As a case in point, prices for some recent contracts for fabricated structural steel are on a level which indicates that either the fabricators are now operating on a smaller margin or are obtaining concessions in the prices for plain material from the mills.

The present market condition is explained by a falling off in demand, but whether this is merely a seasonal condition or the manifestation of a general slowing down in business, is hard to determine. Railroad purchases of rails and track material continue active. It is of interest to note that the recent announcement by one mill of a differential for rails weighing 110 lb. or more has been withdrawn.

	Prices in Cents Per Pound			
	June 20		July 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.15	3.25	3.15	3.25
Track bolts	4.25	4.25	4.00 to 4.25	4.25
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.60 to 2.75	2.60	2.55 to 2.60	2.60
Tie plates, iron		2.85		2.85
Plain wire	2.75	3.09	2.75	3.09
Wire nails	3.00	3.34	3.00	3.34
Barbed wire, galv.	3.80	4.14	3.80	4.14
C. I. pipe, 6 in. to 12 in., per ton		$60.20		$60.20
Plates	2.50	2.60 to 2.80	2.50	2.60 to 2.80
Shapes	2.50	2.60 to 2.70	2.50	2.60 to 2.70
Bars, soft steel	2.40	2.50 to 2.60	2.40	2.50 to 2.60

Open hearth rails per gross ton f.o.b. mill, $43.00.

The scrap market is weak, but as noted in the table below, reductions as compared with quotations of last month are relatively small.

	Prices Per Gross Ton at Chicago	
	June	July
Relaying rails	$32.00 to $35.00	$32.00 to $35.00
Rails for rerolling	19.00 to 19.50	18.00 to 18.50
Rails less than 3 ft. long	20.00 to 20.50	19.50 to 20.00
Frogs and switches cut apart	17.50 to 18.00	17.25 to 17.50
PER NET TON		
No. 1 railroad wrought	15.50 to 16.00	15.00 to 15.50
Steel angle bars	17.00 to 17.50	16.00 to 16.50

In contrast with the above tables for steel and iron, the following tabulations of yellow pine prices indicate a general reduction. While these are moderate in the main, they are directly in line with the decrease in demand. Orders on hand for Southern yellow pine are now only about one-half the total unfilled orders in February.

SOUTHERN PINE MILL PRICES	June	July
Flooring, 1x4, B. and B. flat	$50.42	$48.45
Boards, 1x8, No. 1	40.85	39.35
Dimension, 2x4, 16, No. 1 common	30.55	30.05
Dimension, 2x10, 16, No. 1	31,35	28.95
Timbers, 4x4 to 8x8, No. 1	30.55	31.90
Timbers, 3x12 to 12x12, rough	51.49	43.75
DOUGLAS FIR MILL PRICES		
Flooring, 1x4, No. 2, clear flat	40.00	40.00
Boards, 1x6, 6x20, No. 1, common	18.50	17.50
Dimension, 2x4, 16, No. 1, common	19.50	19.50
Dimension, 2x10, 16 No. 1, common	21.50	19.50
Timbers, 6x6 to 8x8, No. 1, common	24.00	24.00
Timbers, 10x10 to 12x12, rough	26.00	26.00

With a production of portland cement for the first half of 1923 of 62,300,000 barrels or an increase of 33 per cent over the best previous record for a similar period, the cement industry is unquestionably in a healthy condition. Prices remain practically stationary with minor adjustments at one or two points. Quotations are for sacks in carload lots not including package.

Chicago	$0.55	Duluth	$0.56¼
Cincinnati	.63½	Milwaukee	.59¼
Davenport	.60¾	Minneapolis	.62½
Detroit	.62	Pittsburgh	.56

General News

Approach signs for highway crossings, illuminated day and night by acetylene flashlights, are to be erected at a large number of locations in the city of Montreal. These signs will be installed under a contract with the city, continuing for a period of five years, with the expectation that the city will be able to dispense with the services of watchmen at certain crossings.

A special passenger train of seven cars leaving Winnipeg, Man., on July 6, made a continuous run of 1,579 miles over the Canadian Pacific to Quebec, in 36 hours and 12 minutes, equal to 43.6 miles per hour. From Smith's Falls, Ont., to Ballantyne, a distance of 120 miles, the time was 118 minutes. The regular time of the fastest train between Winnipeg and Quebec is 53 hours.

The Utah Construction Company will employ more than 6,000 men on the construction of the 85-mile extension of the Southern Pacific of Mexico, now being built from a point near Tepic to a connection with the National Railways of Mexico 25 miles west of Guadalajara. This work will cost approximately $11,000,000. The construction material and equipment are being delivered at both ends.

The fastest regularly scheduled train in the world, as far as is known, was placed in service on the Great Western Railway (England) on July 9. The new train operates between Cheltenham and Paddington Station, London, and its high speed is made between Swindon and Paddington, a distance of 77½ miles, which the train is scheduled to negotiate in 75 minutes—a speed of 61.8 miles per hour.

Revenue car loadings for the week ended June 30, totaling 1,021,770 cars, were the largest in the country's history and approximately 33,000 cars in excess of the previous record of 1,018,539 reported for the second week of October, 1920. The loadings for the week ending June 30 exceeded the million mark for the fourth consecutive week and were over a million for five out of the six weeks.

The Canadian Pacific is conducting surveys of the water power available on the Columbia river in the vicinity of its main line near Revelstoke, B. C., with a view to the electrification of parts of its line in the Rocky Mountains. The preliminary investigations are the culmination of two or three years of consideration. It is possible that the actual work of construction will be undertaken in 1924.

Rapid progress has been made on the construction of the Castleton cutoff of the New York Central since the inauguration of the work in 1922. This project includes a double-track high-level bridge across the Hudson river about one mile south of Castleton, N. Y. connecting on the east end with double-track branches to the Boston & Albany and to the New York Central main line, and on the west bank of the river with the West Shore railroad, and a large classification yard approximately six miles in length at Feura Bush. The Hudson river is to be crossed by two truss spans, 601 ft. 6 in. and 409 ft. 2 in. long, respectively, flanked on either side by long viaducts. The base of rail is 130 ft. above navigable high water.

The Interstate Commerce Commission on June 26 established a new ruling by refusing authority to the Virginian to construct an extension in Wyoming county, W Va., for the purpose of serving new mines opened up in that vicinity. The ruling was based on the claim that there are now sufficient coal mines in the United States consistent with the efficient use of carrier's equipment and that the Virginian during 28 weeks in the past year could not furnish more than 50 per cent of the cars ordered by the mines on its line. It is anticipated that the Commission's conclusion on the Virginian's application will provoke litigation.

The Atchison, Topeka & Santa Fe now has 64,643 stockholders, composed of 29,820 men, 29,235 women, 123 insurance companies, 108 educational institutions, 93 religious organizations and 89 charitable bodies. The average holding of stock is 55 shares. Of the total number, 14,583 hold five shares, 26,335 hold six to twenty shares, 12,938 hold 21 to 50 shares, 6,378 hold 51 to 100 shares and 4,409 hold over 100 shares.

The temporary injunction against violence in the strike of the Federated Shop Crafts, which was granted last October, was made permanent by Judge J. H. Wilkerson of the United States District Court at Chicago on July 12. By this order, which is one of the most sweeping and drastic restraining orders ever issued by a court in this country, the members of the Federated Shop Crafts, their officers and other affiliated bodies of the American Federation of Labor are restrained for all time from hindering or obstructing the railroads engaged in interstate commerce, from conspiring or confederating to injure the railroads, and from loitering or unnecessarily being in the vicinity of railroad property.

Forty-seven roads have regular pension systems, where pensions are paid to all employees on the basis of a percentage of the employee's earnings, multiplied by the number of years he has been in service, while 22 others follow the practice of paying pensions where it is decided from the merits of the particular case that a pension is deserved. All of the companies having regular pension systems, in counting time, include the years of service under other companies bought by, or consolidated with, the present one and disregard breaks in service not arising from any fault of the employee. All of the roads permit pensioners to engage in another business if it does not conflict with the interests of the railroad company. Voluntary retirement from the service forfeits the right of the employee to all claims to a pension.

The Supreme court of the United States has handed down three decisions recently which establish the necessity for regulatory bodies to give consideration to present costs of constuction in fixing valuations for rate making purposes. In the case of the Southwestern Bell Telephone Company vs. the Public Service Commission of Missouri, the Supreme court condemned the Commission's action for not giving any weight to the greatly increased costs of material, labor, supplies, etc., over those prevailing in 1913, 1914 and 1916, and held that where the present costs were wholly disregarded, no true valuation is made. In a case brought by the Georgia Railway & Power Company against the Railroad Commission of Georgia, the Supreme court refused to acquiesce in the claim of the power company that the valuation should be based entirely upon up-to-date costs of reproduction, but stated that the present cost of replacement should have been considered. In the third case brought by the Bluefield, West Virginia, Water Works & Improvement Company against the Public Service Commission of West Virginia, the court refused to sustain the valuation of the commission which disregarded present costs. These decisions establish the position of the court that in making a valuation of a public utility, the authorities must take into consideration the present cost of reproduction, although a valuation cannot be based solely upon that figure.

Personal Mention

General

M. H. Beard, assistant division engineer on the Baltimore & Ohio, Lines West, with headquarters at Akron, Ohio, has been promoted to assistant trainmaster, with headquarters at Newark, Ohio.

N. L. Howard, general superintendent of the Missouri district of the Chicago, Burlington & Quincy, with headquarters at St. Louis, Mo., and formerly an employee in the engineering department, has been appointed superintendent of transportation, with headquarters at Chicago.

Engineering

R. D. Brown, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Kingman, Ariz., has not been appointed engineer in charge of construction of the National Railways of Mexico line from Mexicali to the Gulf of California, as was reported in the July issue. The new engineer of construction of the Mexican lines is another with the same name.

Carroll R. Harding, assistant consulting engineer of the Southern Pacific, with headquarters in New York City, has been promoted to succeed John D. Isaacs as consulting engineer with the same headquarters, following the latter's retirement, as noted in the July issue. Mr. Harding was born at Hallowell, Maine, on July 4, 1888, and was educated at Baltimore Polytechnic Institute and at Cornell University, receiving from the latter the degree of civil engineer in 1910. For three years thereafter he was employed by the American Bridge Company on surveys in Alaska, Michigan and Costa Rica. He entered railway service on November 1, 1913, as a draftsman in the office of the consulting engineer of the Southern Pacific at New York and in February of the following year was promoted to chief draftsman. He became assistant consulting engineer in 1916.

Carroll R. Harding

C. D. Morrison has been promoted to assistant division engineer on the Baltimore & Ohio, Lines West, with headquarters at Akron, Ohio, to succeed **M. H. Beard,** promoted to assistant trainmaster. **L. E. Martin,** assistant on the engineering corps, has been transferred to Akron, Ohio, and **D. R. Bowman,** assistant on the engineering corps at Newark, Ohio, has been transferred to Dayton, Ohio. Mr. Morrison was born on April 17, 1887, at Sarahsville, Ohio, and after leaving Northern University he was employed for a period of two years as a structural draftsman consecutively with the American Bridge Company, the Riverside Bridge Company and the Mount Vernon Bridge Company. He entered railway service on December 1, 1912, as an assistant on the engineering corps of the Pennsylvania. He left the Pennsylvania on December 18, 1913, and on June 1, 1915, entered the service of the Lehigh Valley as a bridge inspector. He left the Lehigh Valley on December 22, 1915, to become an assistant on the engineering corps of the Baltimore & Ohio at Pittsburgh, Pa. On June 23, 1916, he was promoted to assistant supervisor, with headquarters at Garrett, Ind. He was transferred to Cincinnati, Ohio, on July 29, 1918, as a draftsman and on May 1, 1920, returned to Garrett, Ind., as an assistant engineer, which position he held at the time of his recent promotion to assistant division engineer at Akron, Ohio.

J. A. Lenecek, until recently engaged as engineer in the engineering and construction department of the Erie, with headquarters at New York, has been appointed chief engineer of the Quito-Esmeraldas Railway in Ecuador, S. A., the road being the rail connection of the country's capital, Quito, with the seaport of Esmeraldas. After his graduation in civil engineering from the Engineering University of Prague (Bohemia) in 1912 he was employed on railroad location and on construction of a reservoir project in Czechoslovakia. In 1913 he became construction engineer of the Machacamarca-Uncia Railway in Bolivia, S. A., a railway serving the largest tin mines in the world. Returning to this country he joined the consulting engineering firm of P. M. Klein, New York City, in 1915, where he was engineer in charge of all civil engineering work, and in 1916 he entered the New York office of the Erie, where he has been in charge of designing and estimating for the last seven years.

J. A. Lenecek

R. L. Longshore, whose promotion to division engineer of the Union Belt, with headquarters at Detroit, Mich., was announced in the July issue, was born on June 30, 1891, at Ossian, Ind., and entered railway service in 1910 as a rodman on the Oregon Short Line in Idaho, after having completed a course of study at the Tri-State College, Angola, Ind. He left railway service in 1911 to enter the employ of the James A. Green Construction Company as a rodman on irrigation construction in Oregon, but re-entered railway service in 1912 as an assistant in the engineering corps on the Grand Rapids & Indiana at Fort Wayne, Ind. Again leaving railway service in 1913, he was first employed as an instrumentman for the Fargo Engineering Company, to make surveys for power sites in Michigan, and from 1913 to 1917 was deputy surveyor of Adams County, Ind. Reentering railway service in 1917, he was engaged as an assistant engineer on the Wabash at Montpelier, Ohio, until April, 1921. In October, 1921, he became supervisor of track at Montpelier. He continued in this capacity at Montpelier and at Chicago until October, 1922, when he became assistant engineer, with headquarters at St. Louis, the position he held at the time of his recent promotion to division engineer on the Union Belt.

R. L. Longshore

R. M. Bryant, whose promotion to assistant division engineer of the Western division of the Southern Pacific, with headquarters at Oakland, Cal., was announced in the July issue, was born on July 19, 1883, at Eureka, Cal., and graduated in engineering from the San Jose Normal College in 1897. He entered railway service in 1899 as a rodman on the Coast division of the Southern Pacific, where he remained until 1901, when he became a draftsman in the general office. He left the Southern Pacific in 1905 to become a locating

engineer on the Western Pacific and in 1906 entered the employ of the Ocean Shore railway as a construction engineer. Leaving railway service in 1918 he was engaged for a year as chief engineer of the Carr Consolidated Mining Company, after which he re-entered railway service as an assistant engineer on the Southern division of the Southern Pacific. He became office engineer on the Western division of the Southern Pacific in 1914 and continued in this capacity until 1922, when he was appointed acting assistant division engineer of this division.

Major Eugene Betts, assistant engineer on the Southern Pacific, has been appointed assistant consulting engineer, with headquarters at New York, succeeding C. R. Harding, promoted to consulting engineer, as noted elsewhere in this issue. Mr. Betts was born in Hackensack, N. J., and is a graduate of Rutgers College. From 1907 to 1910 he was located at Bogota, Colombia, rebuilding the street railway and power plant of the Bogota City Railway Company. He served as United States consul-general to Colombia for one year and acted as the traction company's general attorney in the transfer of its properties to the municipality of Bogota. During 1911 he served as a consulting engineer for private interests and from 1912 to 1916 was electrical engineer for J. G. White & Company, New York, in the purchase of a Mexican utility property, representing the company also at Buenos Aires and Santa Fe, Argentina. In 1917 he entered the service of the Thompson-Starrett Company on construction work at Camp Upton and during the same year was commissioned a major in the Construction division of the Quartermaster Corps, serving in that capacity throughout the war. On leaving military service he became an assistant engineer for the Southern Pacific and served in that capacity until the time of his recent promotion.

Eugene Betts

Track

I. E. Short has been appointed roadmaster on the Missouri Pacific, with headquarters at Downs, Kan., succeeding C. T. Murry.

R. E. Meyer has been promoted to roadmaster on the Chicago & North Western, with headquarters at Wall Lake, Ia., to succeed **C. W. Jenkins,** deceased.

L. E. Keeler, whose promotion to roadmaster of the Middle division of the Michigan Central, with headquarters at Jackson, Mich., was announced in the July issue, was born on January 10, 1871, at Stockbridge, Mich., and entered railway service on May 5, 1891, as a section laborer on the Michigan Central at Grant Lake, Mich. He left railway service on March 10, 1892, but again returned on October 10, 1895, as a section laborer at Eaton Rapids, where he was promoted to section foreman on February 1, 1899. He was transferred to Onondaga on March 13, 1901, and to Jackson, Mich., on April 10, 1905. He served as extra gang foreman on the main line during the summers of 1907 to 1917, inclusive, and on April 12, 1918, was promoted to assistant roadmaster of the Middle division, which position he held until it was abolished on March 17, 1921, when he was reappointed section foreman. He served as extra gang foreman during the summer of 1921 and on January 1, 1922, was promoted to yard foreman at Jackson, where he remained until July 3 of the same year, when he was reappointned assistant roadmaster of the Middle division. He was serving in this capacity when promoted to roadmaster.

Bridge and Building

J. B. Kelly, a sketch of whose career was published in the July issue, following his retirement on a pension as inspector of maintenance of the Minneapolis & St. Louis, was not engaged in the service of the Minneapolis & St. Louis road for 14 years, as mentioned, but rather, had been associated for 14 years with Mr. Kenly, chief engineer of that road. Mr. Kelly is also the only living charter member of the Roadmasters' Association.

P. Paulson has been promoted to supervisor of bridges and buildings on the Chicago & North Western at Huron, S. D., to succeed **T. H. Durfee,** who has been transferred to Antigo, Wis., to succeed **John Olk,** retired. **G. W. Miller** has been promoted to supervisor of bridges and buildings at Chaldron, Neb., to succeed **F. E. Shanklin,** who has been transferred to Madison, Wis., to succeed **William Mulcahy,** pensioned. **L. J. McMartin** has been promoted to supervisor of bridges and buildings at Escanaba, Mich., to succeed **L. J. Anderson,** pensioned, and **A. H. Deno,** water supply foreman, has been promoted to supervisor of bridges and buildings of the Lake Shore division, with headquarters at Green Bay, Wis., following the death of **William Sweeney,** and the division of his jurisdiction. Mr. Deno entered railway service in 1905 as a carpenter helper on the Chicago & North Western and continued in this capacity until 1909, when he was promoted to carpenter foreman, since which he was engaged as a foreman on ore dock construction, bridge construction and water supply until June, 1923, when he was promoted to supervisor of the Lake Shore division.

Obituary

William Dailey, a railroad contractor and former superintendent of construction on the Canadian Pacific, died at his home near Montreal on July 9.

Joseph G. Le Grand, bridge engineer of the Western region of Canadian National, with headquarters at Winnipeg, Man., died in that city on July 2. Mr. Le Grand was born on December 24, 1861, at Somtuis, Marne, France. He attended the College of Reims at Marne from 1873 to 1880 and from 1880 to 1881 took special studies at Paris. From 1881 to 1882 he served in the French army. He entered railway service in 1882 with the French government railways, with which he continued in surveying and drafting work until 1887, when he became employed as a contractor's engineer in charge of fortification work at Verdun. From 1889 to 1891 he was engineer with full charge of construction of a mining plant for the Hasna Lead Mining & Smelting Company at North Wales, England, going to Canada in the latter year, where from 1891 to 1893 he was engaged as an assistant civil engineer at Montreal, and from 1893 to 1903 as a structural draftsman, checker and designer in the service of the Dominion Bridge Company. From 1903 to 1906 he was assistant chief engineer of the structural department of the Locomotive & Machine Company, Montreal, and on March 26, 1906, entered the service of the Grand Trunk Pacific as bridge engineer, which position he held until August, 1920, when, incident to the consolidation of this line with the Canadian National, he became bridge engineer of the western lines of the Canadian National at Winnipeg.

The running time of passenger trains between Chicago and Seattle and Tacoma, Wash., and Portland, Ore., on the Chicago, Milwaukee & St. Paul, the Great Northern, the Northern Pacific and the Union Pacific, has been reduced from 72 to 70 hours, effective July 29.

White stripes painted across the road are to be used in New York state to notify automobile drivers of railroad crossings, according to the announcement of the State Commissioner of Highways at Albany. The stripes are to be placed on the hard pavements. They will be 12 inches wide, five feet apart, and will extend across the whole width of the pavement. There will be two stripes located 230 feet from the nearest track and a third stripe 125 feet from the nearest track, the final stripe to be two feet wide located 25 feet from the track, and to consist of diagonal bars, alternately black and white.

Construction News

The Calgary & Fernie has been authorized to construct a new line from Calgary, Alta., to the company's coal fields near the head waters of the Elk river.

The Canadian National is the subject of a bill in Parliament calling for expenditures for the building of additional mileage as follows: Sunny Brae to Guysboro, N. S., $3,500,000; Meductic, N. B., to the U. S. boundary, $1,260,000; Long Lac to Nakima, Ont., $1,944,000; Thunder Hill branch to the Prince Albert branch, Sask., $1,656,000; Bengough Branch past Fife Lake, Sask., $1,404,000; Turtleford branch to near Hafford, $2,313,000; Dunblane branch to Mawrer, $2,767,000; Alliance branch, Alberta, $1,034,000; Hanna branch to Warden, Alberta, $1,445,000; Loverna branch to Westerly, Alta., $1,362,000, and Okanagan branch to Kelowna and Lumly, $2,307,000. The Canadian senate, as one of its last acts before a recess beginning on July 1, postponed action on the bill for six months, as a result of which it will not be considered again until early in 1924.

The Chicago Union Station has awarded a contract to John Griffiths & Son Company, Chicago, for the erection of the headhouse of the Union Station at Chicago, to be completed in 18 months, at a cost of $10,000,000.

The Detroit & Mackinac has been authorized by the Interstate Commerce Commission to construct a 12 mi. extension from its Avery branch at Alpena, Mich., to Rockport.

The Detroit Connecting has applied to the Interstate Commerce Commission for authority to construct and operate a line 85 miles in length from Delray (Detroit), Mich., to Marine City. The projected line would run through Ecorse, Pontiac, Sylvan Lake Village and Mt. Clemens.

The Elgin, Joliet & Eastern is calling for bids for the construction of a new one-story car repair shop at East Joliet, Ill., and will construct a new car repair shop at Joliet, Ill., to replace the building recently destroyed by fire, the new structure to be 300 ft. by 500 ft. and to cost approximately $500,000.

The Fort Myers Southern has been authorized by the Interstate Commerce Commission to construct a 22-mile line from a point near Fort Myers, Fla., to a point near Bonita Springs. The company's stock is owned by the Atlantic Coast Line.

The Illinois Central has authorized the construction of a new 18-stall roundhouse and coaling station at Council Bluffs, Ia., where it will also lay additional yard track, the total cost of the improvement to approximate $500,000. This company plans the construction of an addition to its locomotive shop and car repair shop at Jackson, Tenn., to cost approximately $200,000, and has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of 75-ton steel coaling stations at 83rd street, Chicago, at South Chicago, at Blue Island and Matteson, Ill. This company has awarded a contract to the Ellington Miller Company, Chicago, for alterations and extensions to the freight house at Decatur, Ill.

This company has also awarded a contract to the Railroad Water & Coal Handling Company for the construction of an 80,000 gallon per hour water supply station at Brookhaven, Miss.

The Longview, Portland & Northern has been authorized by the Interstate Commerce Commission to construct and operate a line in Cowlitz and Lewis counties, Washington.

The Louisiana Railway & Navigation will construct a new passenger station at New Orleans, La., to cost approximately $150,000, the building to be a one-story concrete and brick structure.

The Louisville & Nashville has awarded a contract to the Nichols Contracting Company, Atlanta, Ga., for the grading and masonry construction for 16 miles of second track from Baileys, Ky., to Walls End. This company also contemplates the extension of the second track construction from Walls End to Harlan, a distance of approximately 39 miles. The cost of this work is estimated at $3,500,000.

The Michigan Central has purchased 500 acres of land northeast of Toledo, Ohio, as a site for the construction of several miles of storage tracks, and has awarded a contract to the Dominion Construction Company, East Toronto, Ont., for the construction of five miles of new sidings and switch tracks at St. Thomas, Ont.

This company has awarded a contract to the Ellington Miller Company, Chicago, for the construction of an 8-stall, reinforced concrete roundhouse, boiler house, office building and sanding facilities at Grand Rapids, Mich., to cost approximately $100,000.

The Oregon Short Line is calling for bids for the construction of the new line from Orchard, Idaho, to Perkins, a distance of 22 miles, reported in the April issue.

The Pacific Electric is constructing approximately six miles of new yard tracks in its freight terminal at Los Angeles, Cal. The construction of new yard offices is included in the project, the total cost of which will be approximately $198,000.

The Pennsylvania has commenced the construction of a new two-story machine shop at Mt. Vernon, Ohio, to replace a building recently destroyed by fire, and is asking for bids for all work necessary to complete an overhead highway bridge 3,000 feet east of Larabee, Pa.

The Philadelphia & Reading has awarded contracts for the construction of a span of its bridge carrying its westbound track over Cedar Run east of Rossmoyne, Pa., as follows: The sub-structure to Seeds & Derham, Philadelphia; the superstructure to the Shoemaker Bridge Company, Philadelphia, and the waterproofing to the Minwax Company, Inc., New York. This company has awarded the following contracts for the reconstruction of a bridge over Melrose avenue, Chester, Pa.; the sub-structure to C. P. Bower, Chestnut Hill, Pa.; the super-structure to the American Bridge Company, Philadelphia, Pa.; and the waterproofing to Minwax Company, Inc., New York City. This company has awarded a contract to Bennett & Randall, Lebanon, Pa., for the construction of concrete slabs to be used in the reconstruction of 12 bridges between Lurgan and Reading on the Philadelphia, Harrisburg & Pittsburgh and Lebanon Valley branches and between Reading and Allentown on the East Penn branch. The railroad will furnish the necessary steel I-beams, rails for reinforcement, and the cement. Contracts for the waterproofing of these slabs have been awarded to Martin & Breen, Inc.

The St. Louis-San Francisco has awarded a contract to the List & Gifford Construction Company, St. Louis, Mo., for the laying of approximately eight miles of storage and switch tracks at Lindenwood, Mo., and has closed bids for the construction of a new coaling station at the same place.

The Southern Pacific plans the construction of a new power house at San Luis Obisco, Cal., to cost approximately $50,000, also a new $87,000 passenger station at Glendale, Cal., and a new $150,000 passenger station at Ogden, Utah. This company has authorized the construction of a locomotive shop at Los Angeles, Cal., to cost approximately $500,000, which building will be the first unit of the project for additional shop facilities at that point, reported in the February issue.

The Trinity & Brazos Valley plans the construction of extensive freight terminal facilities at Galveston, Tex., where the company now owns eight blocks of land fronting on the harbor. Negotiations are now under way to secure trackage.

The Union Pacific has awarded a contract to the Graver Corporation, East Chicago, Ind., for a 25,000 gallon per hour capacity water treating plant at Armstrong, Kan., and a plant of the same capacity at Marysville, Kan.

This company will construct a freight station, 32 miles of switch tracks, together with water mains, a sewage system, electric light and power facilities, also 20 miles of streets and a dike over four miles long along the Missouri river front, in the development of an industrial district at Kansas City, Kan. Initial expenditures during 1923 will approach a total of approximately $3,000,000.

The Western Pacific has awarded a contract to the W. Murcell Company, San Francisco, for the construction of an addition to its locomotive and car shops at Sacramento, Cal., reported in the July issue.

Supply Trade News

Personal

E. J. Wilkie has been appointed northern sales manager of the Bucyrus Company, with headquarters at Milwaukee, Wis.

J. C. Bloomfield, who has been appointed district representative of the Industrial Works, with headquarters in Chicago, was formerly inspection engineer of R. W. Hunt & Co., Chicago.

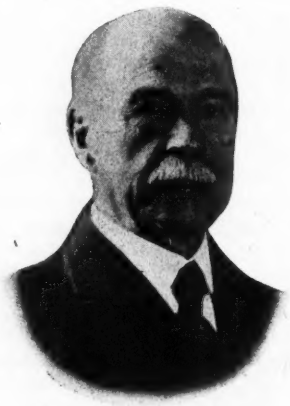
P. E. Carhart, inspecting engineer of the Illinois Steel Company, with headquarters at Chicago, has retired on account of ill health and has been appointed consulting inspecting engineer with unassigned duties.

J. H. Raymaker has been appointed manager of the industrial engineering division of the Roberts-Pettijohn-Wood Corporation, with headquarters at Chicago. **C. W. McKay** has been appointed manager of the appraisal and valuation division.

John N. Reynolds, formerly western manager of the Railway Age Gazette, the immediate predecessor of the Railway Age, died in San Diego, Cal., on July 10. Mr. Reynolds entered the service of the Railroad Gazette in 1875, and retired from active service in 1913.

C. R. Messinger, vice-president and general manager of the Chain Belt Company, Milwaukee, Wis., has been promoted to president, succeeding **W. C. Frye,** resigned. Mr. Frye has been associated with the company for 28 years, during which time he has held practically all executive positions. In 1916 he was promoted from treasurer to president, which position he held until his retirement. Mr. Messinger was general manager of the Sivyer Steel Casting Company prior to entering the employ of the Chain Belt Company in 1917.

Captain Robert Woolston Hunt, president of Robert W. Hunt & Co., Chicago, and for many years an outstanding figure in the steel industry, died at his home in Chicago on July 11 at the age of 85.



Robert Woolston Hunt

He was born on December 9, 1838, in Fallsington, Bucks county, Pa. After spending several years in the rolling mills of John Burnish & Co., Pottsville, Pa., he studied analytical chemistry in the laboratory of Booth, Garrett & Blair, upon the completion of which he entered the employ of the Cambria Iron Works, Johnstown, Pa., where on August 1, 1860, he established the first laboratory in America as a direct part of an iron or steel organization. He entered military service in 1861 as commander of Camp Curtin, Harrisburg, Pa., for the state of Pennsylvania, and in 1864 was mustered into the United States army as a sergeant. Returning to the Cambria Iron Company at the close of the war, he was placed in charge of the works at Wyandotte, Mich., in July, 1865, and in May, 1866, took charge of the Johnstown works, where he had charge of the rolling of the first steel rails made in America on a commercial order. Later he assisted George Fritz, Cambria's chief engineer, in designing and building its Bessemer works, and assumed charge of it on its completion July 10, 1871. On September 1, 1873, he became superintendent of the Bessemer works of John A. Griswold & Co., Troy, N. Y., and in March, 1875, general superintendent of the Albany & Rensselaer Iron & Steel Company.

Mr. Hunt took out several letters patent on steel and iron metallurgical processes and machinery, both individually and in conjunction with others. He installed the first automatic rail mill tables. In April, 1888, he established the bureau of inspection, tests and consultation of Robert W. Hunt & Co., in Chicago.

Mr. Hunt was president of the American Institute of Mining Engineers in 1883, and again in 1906. He was president of the American Society of Mechanical Engineers in 1891, of the Western Society of Engineers in 1893, of the American Society for Testing Material in 1912, and American vice-president of the International Association for Testing Materials in 1914. He was awarded the John Fritz medal in 1912 for his contributions to the early development of the Bessemer process and on June 17, 1923, he received the Washington award, presented by the Western Society of Engineers acting jointly with the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, and the American Institute of Electrical Engineers.

General

S. F. Bowser Company, Fort Wayne, Ind., celebrated the production of its one millionth pump at Fort Wayne, Ind., on June 22. The ceremonies were presided over by F. C. Betchel, president, while S. F. Bowser, in the principal address of the afternoon, traced the development of the company from the day when the first pump was made in a cow barn, 38 years ago, up to the present. Following Mr. Bowser's address the millionth pump was unveiled, with the intention of placing it on the lawn of the Bowser plant as a mark of the company's progress. The 1,800 employees of the company, together with many residents of Fort Wayne, participated in the celebration.

The Portland Cement Association has opened district offices in New Orleans, La., Jacksonville, Tenn., Birmingham, Ala., and Memphis, Tenn., and will also open one in Raleigh, N. C., coincident with which **Walter B. Elcock,** district manager, with charge of the Atlanta, Ga., office, has been appointed assistant general manager in charge of the southeastern offices, with headquarters in the Hurt building, Atlanta. Mr. Elcock joined the staff of the Portland Cement Association in April, 1914. During 1915 he was division engineer in charge of association work in Colorado, Utah, Wyoming and Idaho, and was appointed district manager in charge of the Atlanta office in 1916. He has been continuously with the association since joining the staff, except for two years spent in the army during the war as major of infantry.

Trade Publications

Waterproofing Methods—The Minwax Company, Inc., New York, has recently issued a large sized illustrated folder descriptive of the waterproofing methods utilized in the Chicago & North Western track elevation work at various points in that system. Both photographs and drawings are used to illustrate the methods employed which are likewise described in some detail in the text.

Oil Handling Equipment—S. F. Bowser & Co., Inc., Fort Wayne, Ind., has issued a four-page leaflet calling attention to the increased economy, safety and reduced fire hazard attending the use of thorough going, high grade equipment for the handling of oil in storage or service plants. Illustrations show various installations from the simple gasoline pump and tank to the more elaborate pump service systems.

Track Drainage.—The W. S. Dickey Clay Manufacturing Company, Kansas City, Mo., jointly with the Chattanooga Sewer Pipe Works, Chattanooga, Tenn., the Macomb Sewer Pipe Works, Macomb, Ill., the Macon Sewer Pipe Works, Macon, Ga., the San Antonio Sewer Pipe Works, San Antonio, Tex., the Southern Sewer Pipe Works, Birmingham, Ala., and the Texarkana Pipe Works, Texarkana, Tex., has issued a 60-page booklet, devoted to track drainage, in which detailed descriptions are given of the various kinds of vitrified clay pipe adapted for this service and analyses made of the various factors to be taken into consideration in providing drainage along steam railway roadbeds. Information is given concerning the effect of the weight of various locomotives and on track, and the methods are outlined as to the proper procedure in meeting the drainage problems.

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PURE—The New Jersey Zinc Company's French Process Green Seal Zinc Oxide ground in highly refined linseed oil.

BEAUTIFUL—Makes a white paint that is white and that stays white. Permits of purer tints where color is wanted.

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Your track ends and prevent destruction of property and loss of life by using

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The DURABLE freight or passenger post is easily installed on the threstle or ground and gives you the protection you require.

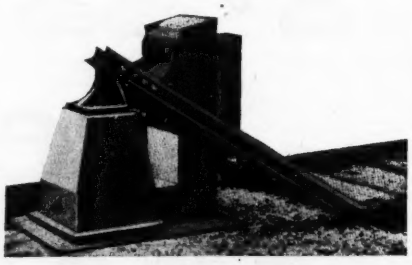
For over twenty years, under every condition of climate and installation, the ELLIS post has proven its superiority.

Where can you buy such positive insurance at such a low cost?

Manufactured and Sold by

THE MECHANICAL MANUFACTURING COMPANY

CHICAGO, ILL.



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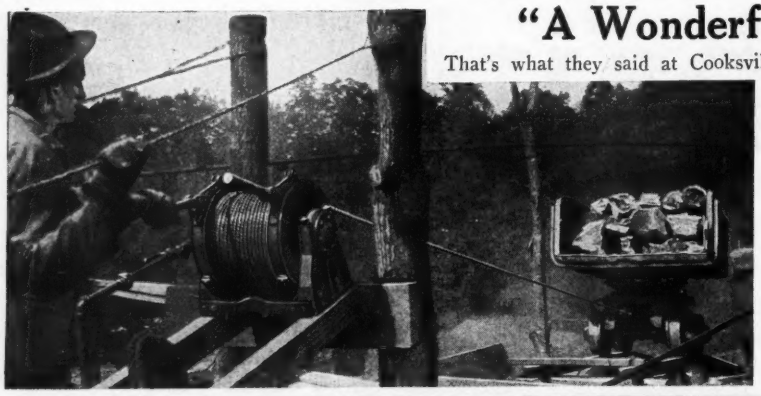


"A Wonderful Little Giant"

That's what they said at Cooksville, Tenn., about this Sullivan Turbinair Hoist, which is used to haul limestone from a quarry to the crusher, 250 feet up a 30-degree incline. The car holds 3 yards of stone and weighs 1,200 lbs. empty. Some pull for a hoist weighing only 285 lbs.! The Turbinair Hoist develops 6½ hp., handles 500 ft. of 5/16-inch wire rope. Its capacity limit is 2,000 lbs. on a vertical lift at 110 ft. per minute.

Bulletin 1976-C

Sullivan Machinery Co.
411 Gas Building
CHICAGO

Save Labor Save Time

Here is a vise stand and pipe bender you can move about and erect in a jiffy wherever you want it. It saves time and labor, making it unnecessary to run back and forth across the shop to the vise stand.

The Martin portable vise stand and pipe bender stands rigidly anywhere, without fastening. Use it for cutting, bending and threading pipe, conduit, etc. It will handle practically any work that can be done on stationary equipment.

Write for name of jobber nearest you who stocks the "Martin."

H. P. MARTIN & SONS

807 West 12th St. Owensboro, Ky.

Keep the Ballast Clean

Western

That's Why

Western Air Dump Car With Apron

Don't dump the muck from your ditches on to your ballast. Western Air Dump Car equipped with extension apron throws the load beyond the ballast line. This practical device is simplicity itself—strong and rigid—operates automatically—discharges the load 40 inches beyond the rail—can be attached to any Western Dump Car, old or new. It solves your problem.

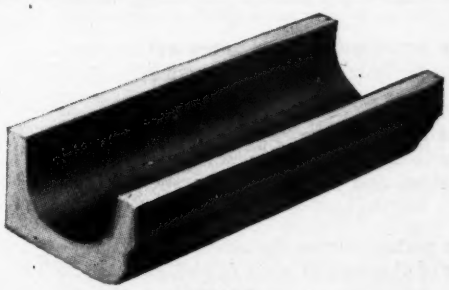
The August Earth Mover was a Railroad Number. Did you receive your copy? If not, send for it.

Western Air Dump Cars are made in 12, 16, 20, 25, 30 and 45 cubic yard sizes, 50,000 to 140,000 pounds capacity. Bulletin M-22-J describes the apron.

WESTERN WHEELED SCRAPER COMPANY

Earth and Stone Handling Equipment

AURORA, ILLINOIS



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REG. U. S. PAT. OFFICE

O. G. FIR GUTTERS

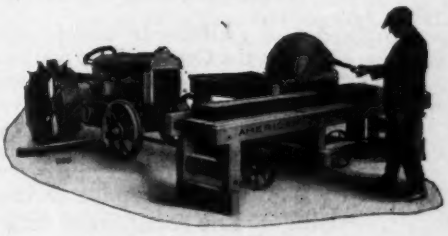
Through twenty-five years of demonstration, we have established the advantages of Douglas Fir over metal gutters.

The Gutters of railway buildings are especially exposed to the corrosive action of smoke and cinder deposit.

Specify Improved O. G. Fir Gutters. They cost less.

E. M. LONG & SONS
CADIZ, OHIO

AMERICAN COST CUTTERS



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Saw Mills, Woodworkers, Planers, Jointers, Band Saws, Resaws, Cut-off Saws

American Saw Mill Machinery Co.
164 Main Street **Hackettstown, N. J.**

October Is Your Opportunity

The Annual Convention of the Roadmasters' and Maintenance of Way Association will be held in Chicago on September 18, 19 and 20.

Railway Engineering and Maintenance

for October will be issued in advance of its regular date, in time for distribution at the convention and will contain all reports and papers to be presented.

It will thus afford to advertisers several distinct advantages as a means of bringing their products to the attention of members at the time they are directly interested in discussing the subjects to which these products relate.

Special Advantages of the October Issue

First—THE OCTOBER ISSUE will be in the hands of every attendant of the convention from opening to adjournment. The officers of the Association rely upon Railway Engineering and Maintenance for copies of reports and papers and from it they are read and used on the floor of the convention.

Second—As its contents will form the basis of all discussions, its advertising pages will be used as a source of reference in these discussions and in outside exchange of views.

Third—Advertisers whose products are represented in its pages will have their special "talking points" in front of those who are discussing reports or any phase of track work.

Fourth—Following the convention the forms will be re-opened and as many pages added as may be necessary to cover the discussions and the activities of the Roadmasters' Association and the Track Supply Association—thus completing the record.

Fifth—In addition to the advantages named above the advertiser in the October issue will receive the benefits of the regular issue as well as of the additional circulation.

MAKE YOUR RECORD COMPLETE

by using liberal space in the October issue. The time is ripe for advertising. The roads must buy and are buying.

FORMS CLOSE SEPTEMBER 8

Make your reservation for space now and secure the benefits of the regular issue and the 1000 extra circulation.

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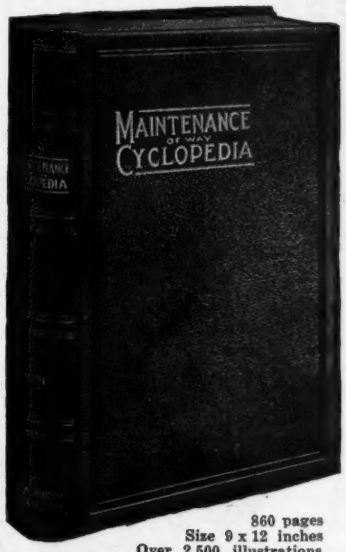

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Size 9 x 12 inches
Over 2,500 illustrations
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EIGHT Tools in ONE

The Maintenance of Way Cyclopedia—a "Handy-Kit" for Maintenance Men

Each of Its Eight Sections Is a Complete Working Tool

The Cyclopedia is a kit of tools you can apply in any emergency and in your daily maintenance operations, small or large. No matter what your position, you need (these days, particularly) to be the "man who knows his job."

The volume gives the necessary background of authoritative knowledge and covers the maintenance of way field from A to Z. Compiled with the aid and co-operation of the American Railway Engineering Association, the Railway Signal Association and other related organizations, it gives their recognized rules and practices. The text is written in plain English. There are over 2,500 illustrations presenting a complete picture of maintenance of way devices, materials and methods of use, well arranged and thoroughly indexed.

The value of the Maintenance of Way Cyclopedia to you cannot be calculated in terms of money. The more you use it, the more it is worth to you in your present position or in preparation for one higher up.

The Cyclopedia is Divided into Eight Sections as Follows:

1. **Track Section—210 Pages.**
   Track laying methods and appliances as well as those used in maintenance work are described and defined. Hundreds of drawings, photos and sixteen large folding plates showing switch layouts, etc., are included.
2. **Bridge Section—77 Pages.**
   Types of bridges and methods used in their construction are described and illustrated. A.R.E.A. specifications for bridge design and erection are given.
3. **Building Section—74 Pages.**
   Various types of railway buildings—passenger stations—coaling stations—engine and freight houses, etc., are described and illustrated by photographs of actual buildings and drawings.
4. **Water Service Section—47 Pages.**
   Appliances and tools needed for water service work are described and pictured in a comprehensive manner.
5. **Signal Section—120 Pages.**
   Principles and apparatus used in modern railway signaling are covered. Signal systems are illustrated in detail.
6. **Wood Preservation Section—24 Pages.**
   Treats the subject fully, including a key for the identification of woods as well as specifications for different preservative treatments.
7. **General Section—77 Pages.**
   Information regarding construction and camp equipment as well as a large number of tools and devices which are used in more than one of the foregoing sections is given.
8. **Catalog Section—240 Pages.**
   Describes in a specific manner various machines and appliances used in maintenance work and where they may be obtained.

All the subjects treated in the several sections are listed alphabetically in a **General Index.** The **Catalog Section** contains in addition to the alphabetical **Trade Name** and **Classified Indexes,** detailed descriptions of products you are interested in.

$40 Worth of Maintenance Knowledge for $10

The Cyclopedia is divided into 8 sections which are described in the panel at the left. If these 8 sections, each one of which is complete in itself, were published separately the cost would be prohibitive, to some, owing to the vast amount of time and research necessary. At the very lowest possible estimate these eight books would have to sell at an average price of $5.00 each. And you have a chance to obtain them, bound in one readily accessible volume, at a cost of little over $1.00 apiece!

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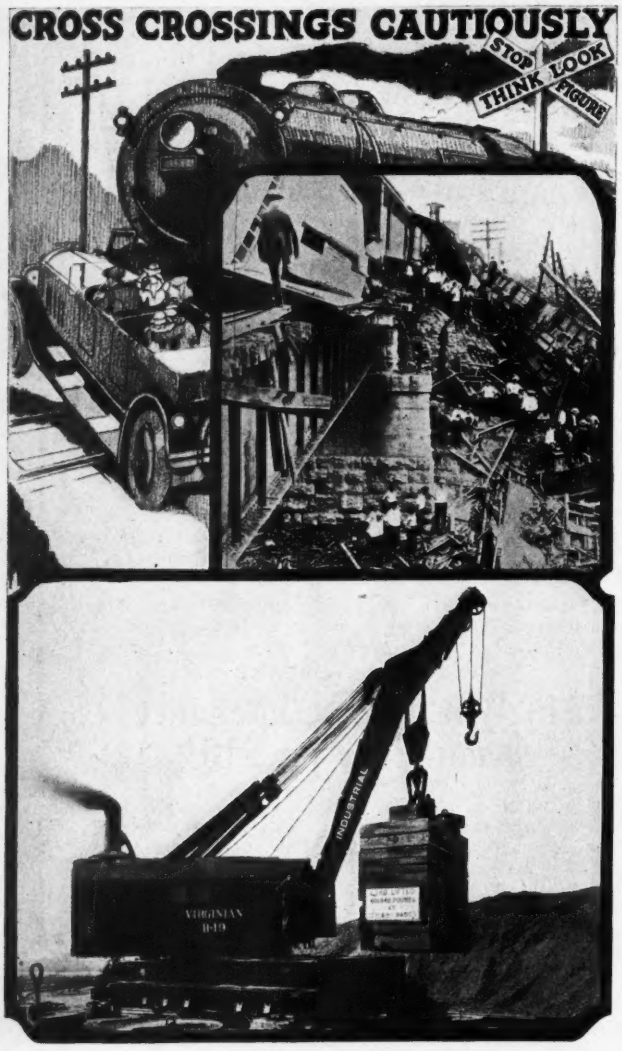
"The House of Transportation"



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Undesirable, But Possible Any Hour

If an unavoidable wreck happened today on your lines, are you equipped to clear the right-of-way and bring back on tracks the modern heavy rolling stock?

INDUSTRIAL WRECKERS

are a real safeguard for such emergencies. An investment in this equipment pays big dividends. Built in capacities of 200, 160, 150, 120, 100 and 75 tons.

INDUSTRIAL WORKS

BAY CITY, MICHIGAN

NEW YORK PHILADELPHIA
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Sales Engineers in All Principal Cities

1873 BUILDERS OF CRANES FOR 50 YEARS **1923**

OLDEST AND LARGEST MANUFACTURERS OF LOCOMOTIVE AND WRECKING CRANES IN THE COUNTRY.

YOUR BEST CRANE HELPER

Full Efficiency From Your Crane With a Blaw-Knox Bucket

Built by master bucket builders who know how to fit your crane with the proper clamshell for the digging or rehandling work required.

Built by master bucket builders who know the value of rugged castings, forged corner bars, husky scoops, big pins, proper design to prevent wear and tear on wire rope, etc.

BLAW-KNOX BUCKETS are built to last with a minimum of expense for upkeep and repairs.

BLAW-KNOX COMPANY
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Blaw-Knox Bucket mounted on a BUCYRUS 14-B SHOVEL

A BLAW-KNOX BUCKET

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Use this section when seeking a new man, a new position, or when buying or selling second-hand equipment.

CLASSIFIED ADVERTISEMENTS—$6 an inch, one inch deep by three inches wide, an insertion.

EMPLOYMENT ADVERTISEMENTS—5c a word a month. Minimum charge, $1.00. Remittance must accompany each order.

Railway Engineering and Maintenance
Classified Advertising Department
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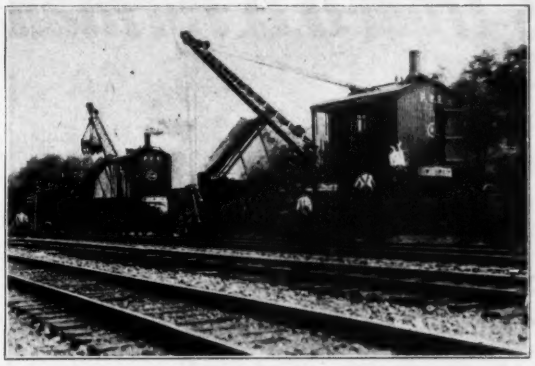
POSITION open for Draughtsman and Computer in Mexico. Railroad experience necessary. Salary $175, U.S.C. Apply Chief Engineer, S. P. de M. R. R. Company of Mexico, Empalme, Son., Mexico.



Osgood Heavy Duty Ditcher Cleaning Ballast

MEET THE LABOR SHORTAGE

With an OSGOOD Railroad Ditcher and Locomotive Crane. A most useful combination—will ditch right-of-way, reduce grades, widen shoulder, lay rail, pile ties, stock coal, in fact anything that requires a crane. Railroad, Continuous tread or Traction mountings all interchangeable.

¾ and 1 yard capacities

Railroad Ditcher Bulletin for the asking

The OSGOOD Company
Marion, Ohio, U. S. A.

Kilby Frog & Switch Co.

Birmingham, Ala.

Manufacturers of

Railroad Crossings, Frogs and Switches

Manganese Track Work a Specialty

Balkwill Cast Manganese Articulated Crossings

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(*The Savers of Maintenance*)

"Does the work of an army of men"

THE JORDAN SPREADER-DITCHER AS A LABOR SAVER

The Jordan Spreader-Ditcher Saving Labor on the Santa Fe

THE JORDAN IS AN ALL-THE-YEAR-'ROUND MACHINE. IT SPREADS EARTH, DIGS DITCHES, TRIMS BALLAST, SHAPES BANKS, RIPS OUT ICE, FIGHTS SNOW.

Descriptive Literature Upon Request

O. F. JORDAN CO.
EAST CHICAGO, IND.

Pipe Lines from B.B. Forman

B. B. Jr.:

I see by your last letter your getting the idea about saving labor. Every time you save by having the work or the gang better organized thats all right. Every time you save by skimping the work thats all wrong.

They was just one place I saw in your letter where your still on the wrong track. You talked about teying to get the old man to let you cut out the grouting on new culvert pipe replacing old wooden boxes. Sure I know the old box will probably hold the pipe to line but that aint the idea. Ive seen some good track ruined by seepage from open joints in culvert pipe and Ive seen some good pipe busted by settlement of a fill caused by this same thing.

So take it from me when the old man says grout those joints you grout them whether their in old boxes or not. I tell you that Massey pipe your getting is the best their is. If you get it laid right it will be there when Im a greatgrandpa.

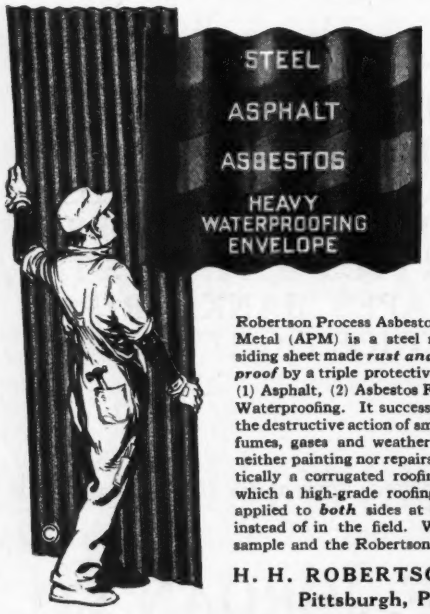
So the old man promised to getyou a Suprês job when the construction work is done. Your pulling a heavy drag now boy. Go to it.

As ever your Dad,

B.B.F.

MASSEY CONCRETE PRODUCTS CORPORATION, Peoples Gas Building, Chicago

For Roofs and Siding on Railroad Buildings



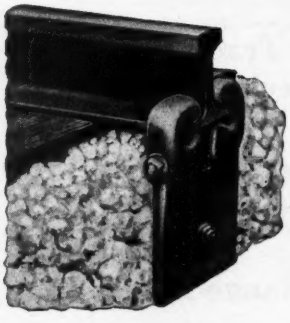
Robertson Process Asbestos Protected Metal (APM) is a steel roofing and siding sheet made *rust and corrosion proof* by a triple protective coating of (1) Asphalt, (2) Asbestos Felt and (3) Waterproofing. It successfully resists the destructive action of smoke, steam, fumes, gases and weather. Requires neither painting nor repairs. It is practically a corrugated roofing sheet to which a high-grade roofing has been applied to *both* sides at the factory instead of in the field. Write for a sample and the Robertson Catalog.

H. H. ROBERTSON CO.
Pittsburgh, Pa.

ROBERTSON PROCESS ASBESTOS PROTECTED METAL

The Lundie Tie Plate

Will give rail and wheels longer life.
Will hold gauge and not injure a single fibre of the tie.
Will not rattle.



The Lundie Duplex Rail Anchor

Requires only one anchor per rail.

Will hold in both directions.

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920 Broadway, New York
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Helping a Lame Duck

never did any permanent good—not even to the duck. Why not stop trying to maintain your quick-corroding black and wrought pipe and put in the everlasting

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Made in sizes 1¼ and 2 inches, and up to 6 inches, it is helping a dozen of America's greatest railroads today to end their troubles with rust and leakage in their small underground pipe lines. Ask for fact-booklet R.

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The Q & C Universal Guard Rail Clamp provides a strong and safe means for absolutely securing the guard rail under heavy traffic. They can be easily and quickly applied without removing the guard rail.

The yoke is drop forged, high carbon, open hearth steel of the "T" beam construction. The wedge, adjustable filler blocks and shoe are made of high grade malleable iron and accurately fitted to the section of rail. Yokes are heat treated when specified.

The shelf on the wedge and the wide bearing surface of the shoe maintain the vertical alignment of the yoke.

As the yokes are interchangeable for all standard "T" section of rail, it is only necessary to order new malleable fittings when changing rail sections.

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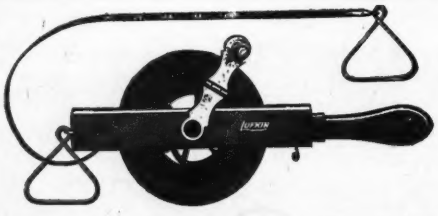

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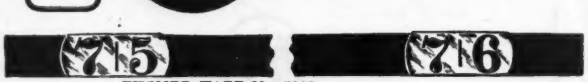

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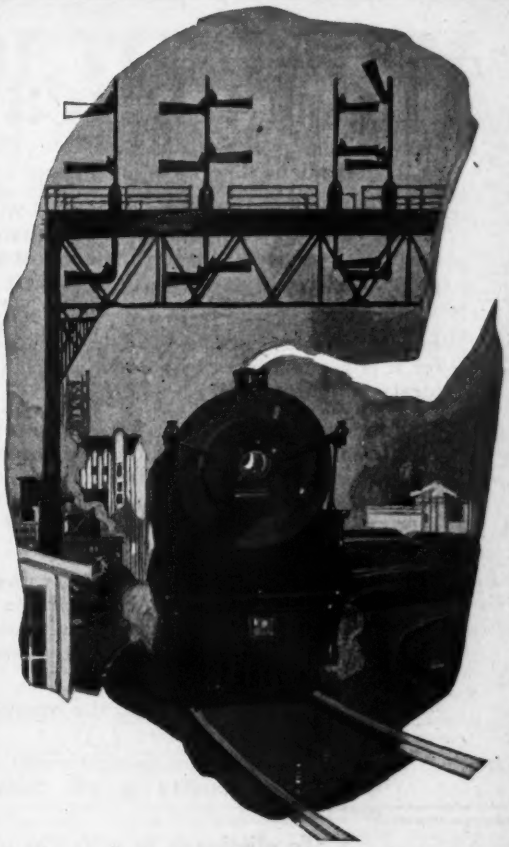

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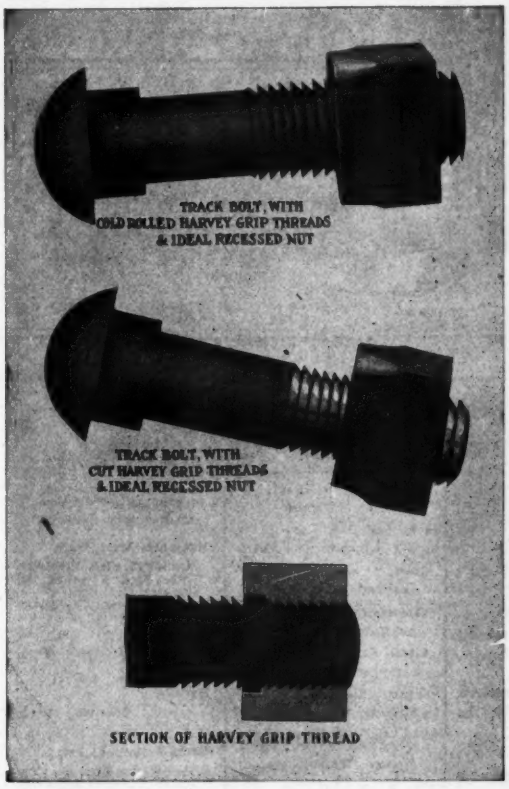
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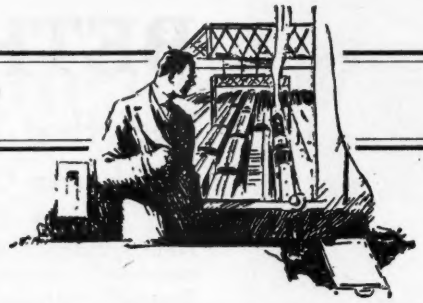

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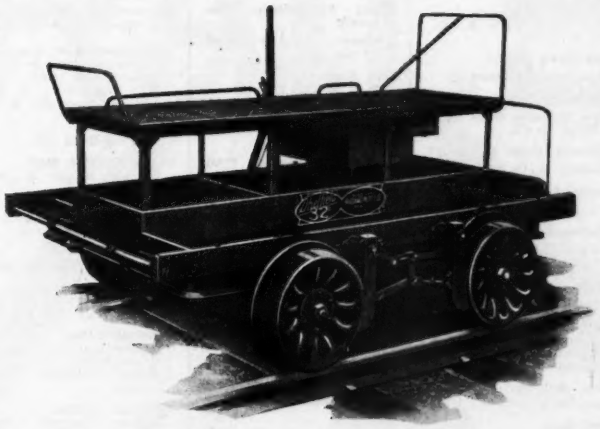

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Roof Slabs.
Massey Concrete Prod. Corp.

Roofing, Asbestos.
Robertson Co., H. H.

Roofing Corrugated.
Robertson Co., H. H.

Roofing and Siding.
Fairbanks, Morse & Co.
Robertson Co., H. H.

Rules.
Lufkin Rule Co., The.

Saws, High Speed Friction.
American Saw Mill Co.

Scrapers, Wheeled, Drag & Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
Massey Concrete Prod. Corp.

Sheets, Corrugated.
Robertson Co., H. H.

Sheets, Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Sheet Steel.
Inland Steel Company.

Shovels.
Wood Shovel & Tool Co., The.

Siding, Corrugated & Plain.
Robertson Co., H. H.

Signal Foundations, Concrete.
Massey Concrete Prod. Corp.

Skid Shoes.
Q & C Co.

Skylights.
Robertson Co., H. H.

Slabs, Concrete.
Massey Concrete Prod. Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Prod. Corp.

Snow Melting Devices.
Q & C Co.

Snow Plows.
Jordan Co., O. F.
Q & C Co.

Spikes.
Bethlehem Steel Company.
Inland Steel Co.

Spreaders.
Jordan Co., O. F.

Standard Tee Rails.
Bethlehem Steel Company.
Inland Steel Co.

Standpipes.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Station Houses.
Massey Concrete Prod. Corp.

Steam Shovels.
Erie Steam Shovel Co.
Osgood Co., The.

Steel Forms.
Blaw-Knox Co.

Steel Plates and Shapes.
Bethlehem Steel Company.

Step Joints.
Q & C Co.
Rail Joint Co.

Street Railway Special Work.
Bethlehem Steel Company.

Structural Steel.
Bethlehem Steel Company.
Inland Steel Company.

Switches.
Bethlehem Steel Company.
Frog, Switch & Mfg. Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Switch Locks.
American Valve & Meter Co.

Switchmen's Houses.
Massey Concrete Prod. Corp.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Tampers.
Ingersoll-Rand Co.

Tanks, Elevated Steel.
Chicago Bridge & Iron Works.

Tanks, Oil Storage.
Chicago Bridge & Iron Works.

Tank Valves.
American Valve & Meter Co.

Tapes.
Lufkin Rule Co., The

Telegraph Poles.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Telephone Booths.
Massey Concrete Prod. Corp.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Company.
Inland Steel Company.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Company.

Tin Plate.
Bethlehem Steel Company.

Tongue Switches.
Bethlehem Steel Company.

Tool Steel.
Bethlehem Steel Company.

Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Torches, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Track, Portable.
Western Wheeled Scraper Co.

Track Drills.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.
Q & C Co.

Track Jacks.
Verona Tool Works.

Track Liners.
Crowley & Co., Thomas D.

Track Material.
Inland Steel Company.
Ramapo Ajax Corp.
Weir Frog Co.

Track Scales.
Fairbanks, Morse & Co.

Track Tools.
Fairbanks, Morse & Co.
Q & C Co.
Verona Tool Works.

Trestle Slabs.
Massey Concrete Prod. Corp.

Vacuum Pumps.
Ingersoll-Rand Co.

Ventilators, Shop, Roundhouse
Robertson Co., H. H.

Vise Stands.
Martin & Sons, H. P.

Washers.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Weed Killer.
Reade Mfg. Co.

Wheels (Hand and Motor Car).
Fairmont Railway Motors, Inc.
Mudge & Co.
Woolery Machine Co.

Wire.
Armco Culvert & Flume Mfrs. Assn.

Wire Rope.
Fairbanks, Morse & Co.

Wood Preservative.
International Creosoting & Construction Co.
Reade Mfg. Co.

Zinc Chloride.
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STANDARD SECTION TEE

RAILS

OF HIGHEST UNIFORM QUALITY

All Rails manufactured by us are rolled from Basic Open Hearth Steel and from RE-HEATED BLOOMS with not less than 28 passes from Ingot to Finished Rail

TRACK ACCESSORIES

TRACK BARS—Heat Treated
TIE PLATES—Medium and High Carbon, Hot Punched
TRACK BOLTS—Heat Treated
TRACK SPIKES—Medium and High Carbon

INLAND
BASIC OPEN HEARTH
STEEL PRODUCTS

INLAND STEEL COMPANY

38 South Dearborn Street, Chicago

Works: Indiana Harbor, Ind. / Chicago Heights, Ill.

Branch Offices:
Milwaukee, Wis., St. Louis, Mo., St. Paul, Minn.

You're paying for them anyway—

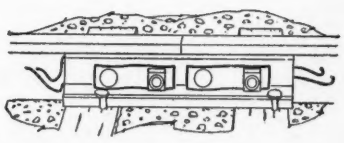
You may as well get what you pay for.

It is true that Verona Rail Joint Springs cost more than nut locks, but they do more than nut locks. They make joint bolts tight and keep them tight without periodical tightening.

What you pay for tightening nutlocked bolts would pay for Rail Joint Springs many times over.

In one way or another, you are paying for the springs.

You may as well get what you pay for. You may as well avoid the worn joints, battered rail ends, joint tie abrasions, wrecks, derailments, and delays that result from loose joints.



VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco New Orleans Montreal Washington